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THE FOUNDRY

VOL. 17. DETROIT, MICH., JANUARY, 1901. NO. 101.

PUBLISHED MONTHLY BY

THE FOUNDRY PUBLISHING CO.

DETROIT, MICH.

JOHN A. PENTON, - - - EDITOR.

SUBSCRIPTION PRICE:

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.
$1.75 a year to other countries, postage prepaid.
Single Copies, 15 Cents.

ADVERTISING RATES ARE PRINTED IN EACH ISSUE

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We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

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Trade Outlook.

While the year just closed has not fulfilled all the promises which were made for it a year ago, it has nevertheless been a fairly busy one.

The abnormal prices of all kinds of material have given way to a legitimate level of values, under which it is possible to count with some certainty upon the future.

It is doubtful if the foundries at large secured much benefit from the boom in the iron trade. The latter led to great enlargement of foundry capacity which it is now found difficult to keep filled with work.

Probably the malleable trade saw the greatest increase in producing capacity. In addition to several very large new works being constructed there was an almost universal enlarging of older plants. To-day the result of this is being felt in increased competition whenever shop managers attempt to operate their works to the limit.

What has been said about the malleable trade might also without change be made to apply to the steel casting business. Here, too, several large new plants have been built, as a rule by practical men, who have withdrawn from older concerns, and enlargements have been common.

The common every day jobbing founder, who does not know to-day what he will be doing a month hence, has had a rather uneventful year, interspersed with a few rebellions of molders to break the monotony. The latter gentlemen have shown a wonderful ability to hang together and there is but few foundrymen who can say that they have won a victory over their molders without paying full price therefor.

There is much work to be done at home and abroad and with other industries busy the foundries will not want for something to do. 1901 does not open with as much noise as its predecessor, but it may in the end accomplish more.

It is the Dollar that Counts.

The rapid growth of the National Founders' Association and the high financial standing of its membership, once more serves to demonstrate that people are much more ready to band themselves together for a purpose which brings visible and tangible results than to join hands in anything in which the benefits to be derived appear remote.

Outside of the trade journals the different foundrymen's associations have probably accomplished more in an educational way for the trade at large than any other factor in its development and yet not one foundry in twenty has shown a willingness to plank down ten dollars a year to help this educational movement along.

There surely must be a reason for this apathy towards the general run of foundrymen's associations and those acquainted with their workings will not have to look far for this. In the majority of instances the organ-

ization and management of the foundrymen's interests has been carried on by people who never worked in a foundry. The practical foundryman has found so much chaff in the papers and discussions dished up for his delight as to make it difficult for him to pick out the few practical ideas which had unconsciously strayed in.

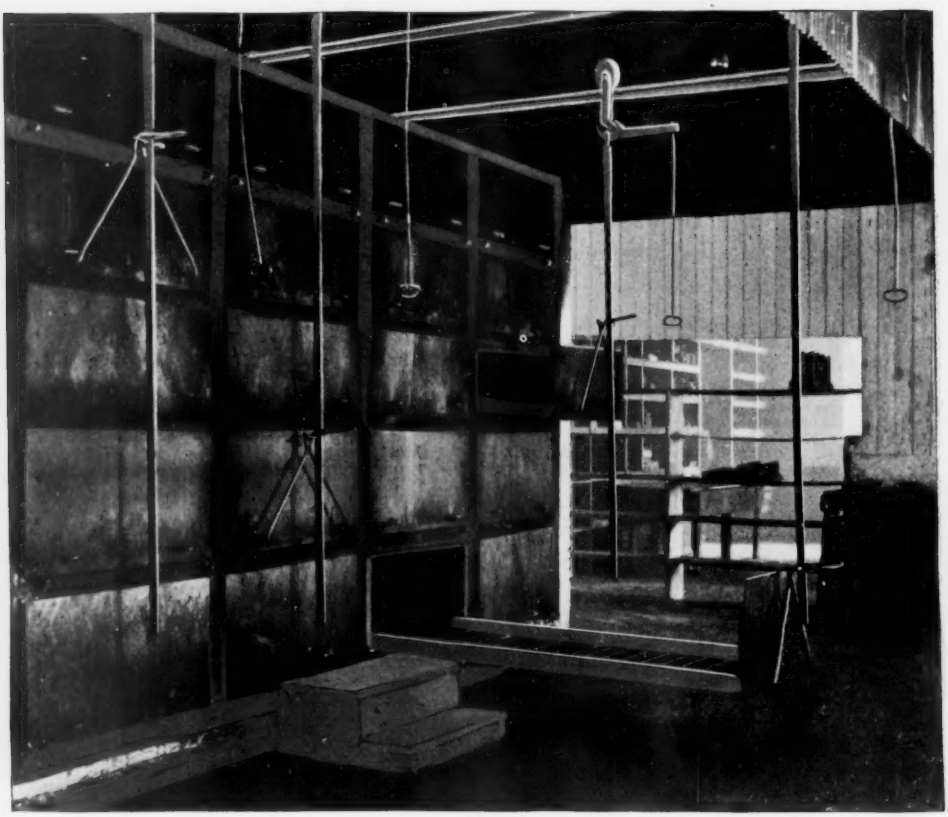
We all know that investigations must be made in any trade before progress can be made, but the fact remains that the majority of us will never form committees of one to brood over phenomena which people with greater brain have given up.

The different foundrymen's associations have had an overdose of theoretical arguments during the deliverance of which more than one member has fallen asleep. We do not gainsay the value of these things, but we do think that this kind of information should be handed to those who can at least understand its language.

Take away the camp followers and those who know nothing of practical founding from these meetings of foundrymen and how many are left? The phenomena of cast iron may be ever so beautiful and worth delving into but it inflicts a certain discomfort upon the practical man who is compelled to listen to a whole lot of stuff he can not understand.

The hobbies of the few can never interest the many. There is no bond of interest between the man who only knows the foundry in theory and the man whose life has been spent in the shop. The former may mean ever so well and yet his remarks will sail over the heads of his hearers without leaving any impression.

The average man is what an association of any kind must reach to be successful. It must reach him to do the most good. If more than ninety-five per cent of the foundrymen in the country have refused to become affiliated with the foundrymen's associations,



TAGGART CORE OVEN.

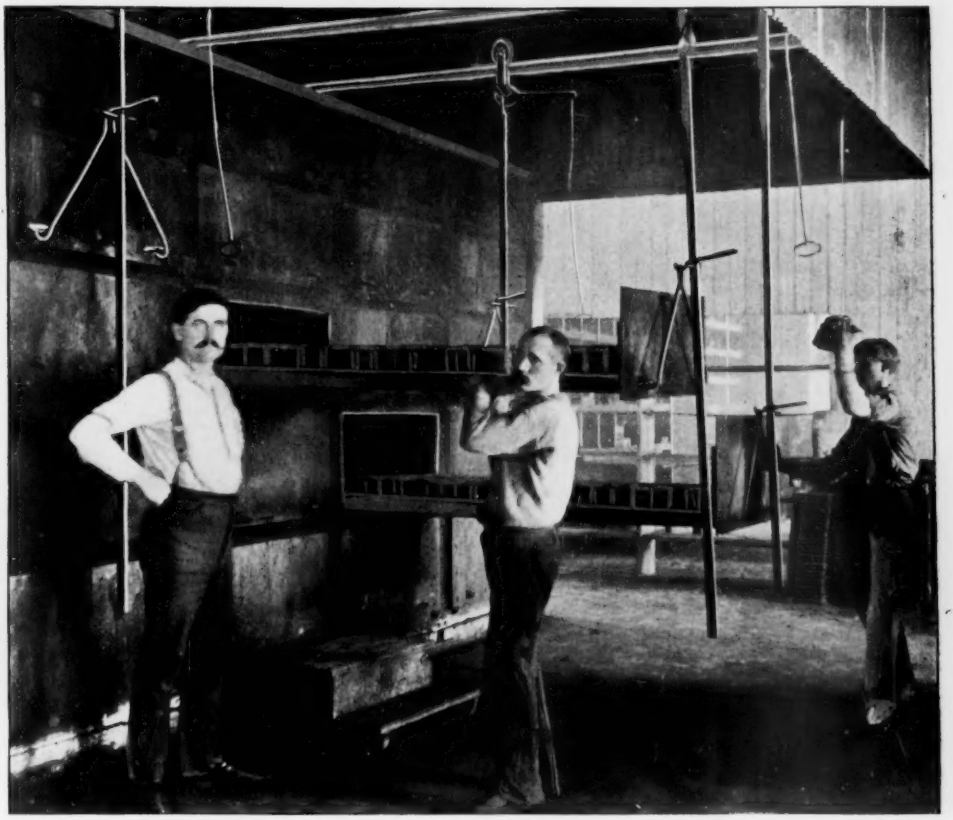
the cause is probably to be found in the fact that these men felt they could not meet people of their own kind.

Nor should it be forgotten that on more than one occasion the discussion at foundrymen's meetings, if not actually some of the papers presented, has drifted dangerously close to a point where it would have to be considered as advertising pure and simple. It is a sort of a selfish interest the foundryman takes in such matters, but we believe we hit the nail nearly square when we say that he refuses to pay a dollar out unless he can see some chance of getting at least a dollar back.

The Taggart Core Oven.

We illustrate herewith a core oven designed by F. S. Taggart, superintendent of the Missouri Malleable Iron Company, at East St. Louis, Ill., which possesses several points of interest in core oven construction. Besides being in use at the plant of the Missouri Malleable Iron Co., types of these ovens have also been built for the Union Malleable Iron Co., Moline, Ill., and the Pratt & Letchworth Co., of Buffalo, N. Y.

Fig. 1 is a plan of the oven showing the arrangement of firing pit and grate bars. Fig. 2 is a plan of the oven at a higher elevation and shows the construction of the shelves if we may be permitted to call each apartment of this oven a shelf.



TAGGART CORE OVEN.

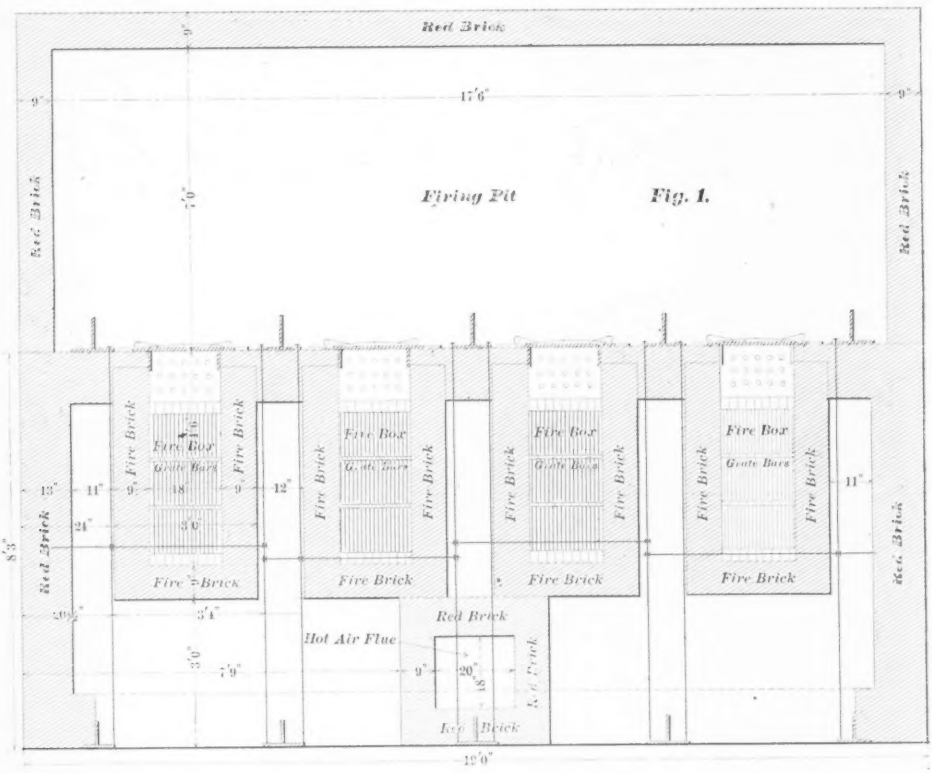
By looking at the front elevation, Fig. 3, it will be noted that the oven as here built consists of sixteen compartments. On referring to the sectional view, Fig. 5, it will be seen that each of these is reached by a lever A suspended from a trolley B, moving on track C. Whenever it is desired to remove some cores from the oven or to fill the shelves this lever is adjusted and attached to the shelf which is then pulled forwards, the front part being supported by the lever

and trolley A and B, while the rear end is carried by the wheels D. As the shelf is brought forward the front opening E is closed by the guard F, thus keeping the oven in practically continuous operation and interfering in but the smallest degree with its working.

Fig. 4 is a rear elevation, from which it will be noted that the firing pit is below the floor level and opposite from the front of the oven. This is a decided improvement in construction as the oven proper is at all times easy of access to the coremakers, who are in this case free from the annoyance so often found where the firebox is located in front.

Fig. 6 shows in detail the construction of the lever and trolley arrangement, while Fig. 7 gives a sectional view of the wheels with roller bearings.

The chief object of this form of construction is of course to produce a core oven which shall at all times be ready of access and one which may at the same time be kept in continuous operation. The two half-tone illustrations convey a very fair idea of the general appearance of these ovens under actual shop conditions.



Plan

TAGGART CORE OVEN.

The Kranks Korner.

I believe it is possible to carry a joke too far.

We all know of the present fashionable idea of believing that a foundry never did amount to much, anyhow.

If we swallowed everything an editor can say while sitting in an easy chair we would be convinced that the molder never did turn out a fair day's work.

* * * *

The reason I do not believe the yarns some authorities on everything pertaining to the iron trade are grinding out at so much per grind is that I have not forgotten what it is to work at the molder's trade.

Not one of those who say that the molder does not turn out a day's work has ever carried the single end of a two hundred and fifty pound bull ladle.

Not one of them has ever taken a sweat bath such as the molder receives.

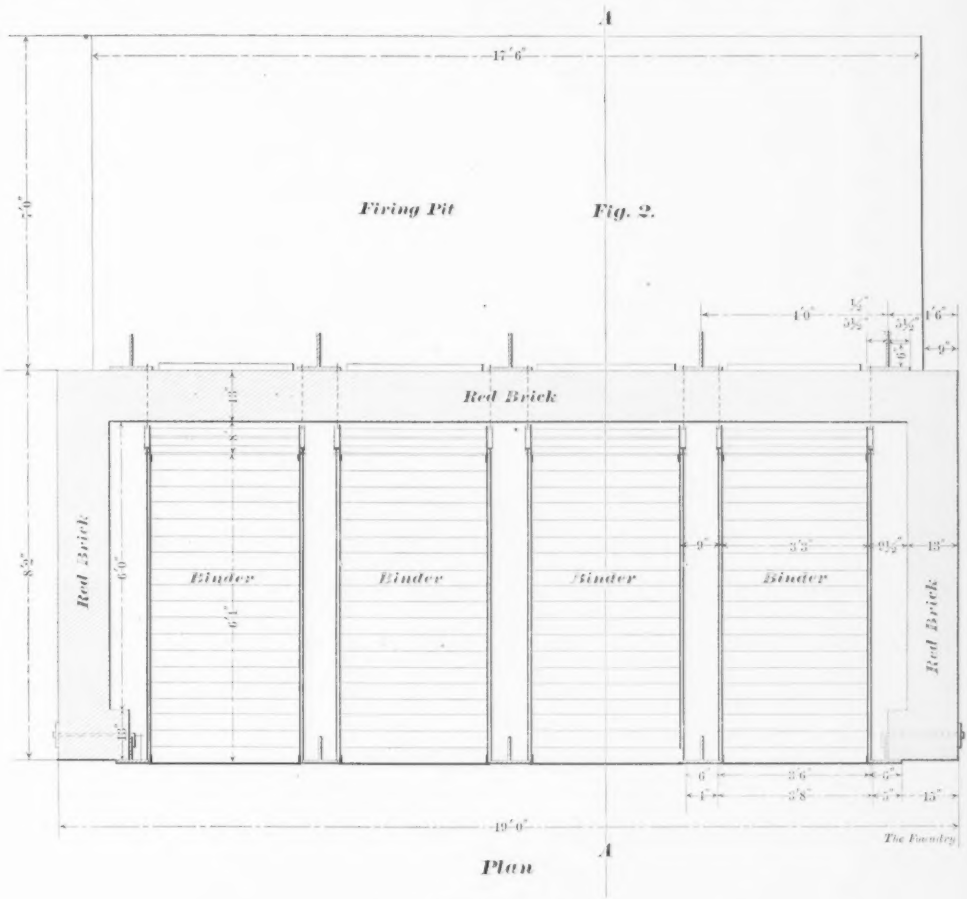
* * * *

After one is filled up with terrapin stew, champagne and Havana cigars it becomes an easy matter to figure out that some portion of mankind is not developing the muscular energy it should.

But setting the example becomes a very different thing.

paper on "Recent Improvements in Foreign Shipbuilding Plants." In the discussion which followed one W. D. Forbes, of Hoboken, New Jersey, who is credited with being an expert whose utterances are entitled to great weight said:

"I look for a very great advance in cheapening products, especially for large engines, in the foundry. There is the place we are not doing the work we ought."



Plan

Fig. 2.

TAGGART CORE OVEN.

Let these editors of trade journals who are continually demonstrating the molders' lack of push go out into the shop and do the amount of work the molder is doing now, and there will not be one of them who will ask for a greater task.

Not one.

* * * *

At a recent meeting of the Society of Naval Architects and Marine Engineers Assistant Naval Constructor H. G. Gillmor presented a

This is a fine opinion which Mr. Forbes holds of every foundry doing marine work.

Fortunately it is not a heavy-weight opinion.

I have a suspicion that before Mr. Forbes crossed over to the Tammany side of Hoboken he indulged rather freely in a product known as Jersey Lightning.

When the stock of orators ran short Mr. Forbes took for his subject the shortcomings of the foundry.

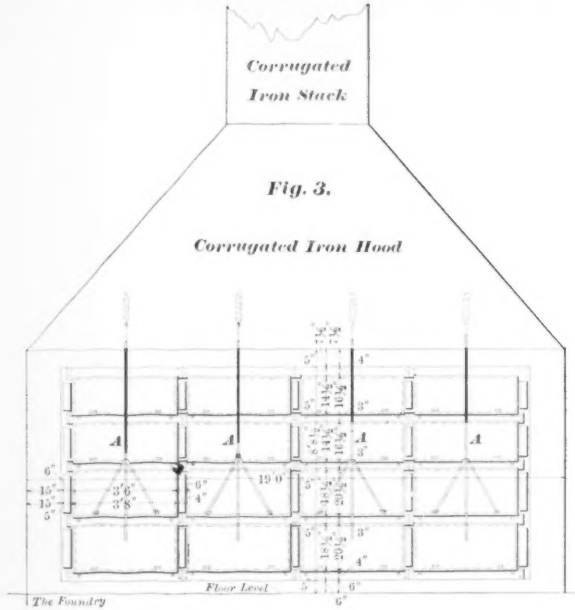


Fig. 3.

Corrugated Iron Hood

Front Elevation

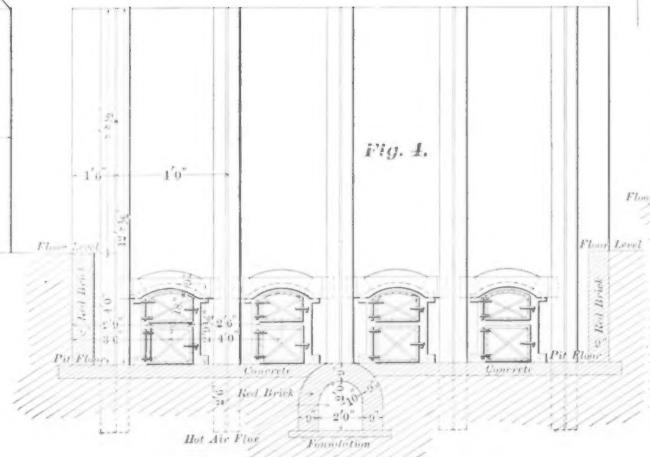


Fig. 4.

Rear Elevation

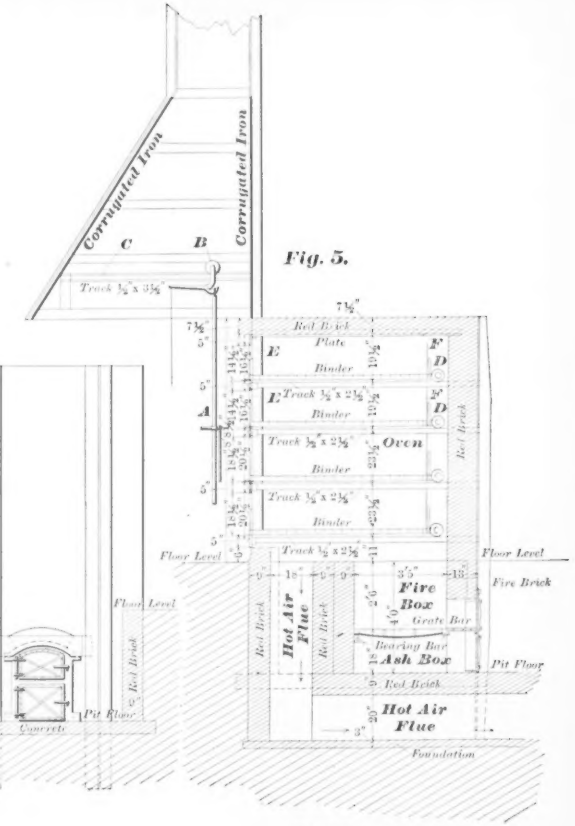
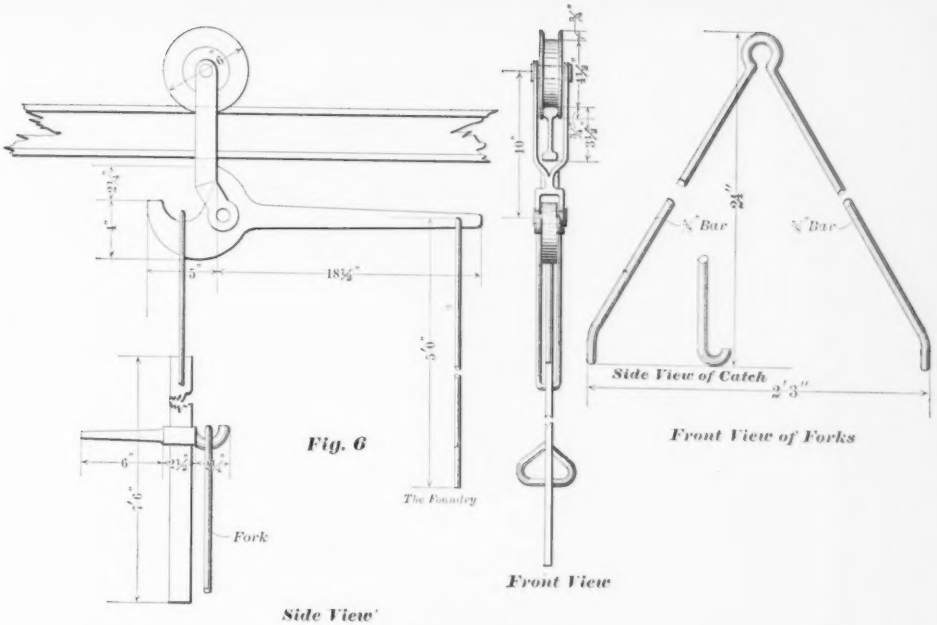


Fig. 5.

Section at A-A

TAGGART CORE OVEN.



TAGGART CORE OVEN.

This is a favorite theme with those who know nothing about the foundry business.

It is a subject on which any one with a college education can preach until his hearers beg for relief.

The less a man knows about anything the easier it is for him to make a lengthy speech about it.

But just the same the chances are that when it comes to turning out the castings for marine engines we can find a foreman or two who can give Mr. Forbes cards and spades and then beat him.

At least this is my opinion.

* * * *

The majority of those who clamor for more work from the molder's hands look at the question in the wrong light.

They compare him to the locomotive engineer and the machinist who run their machines at full speed.

* * * *

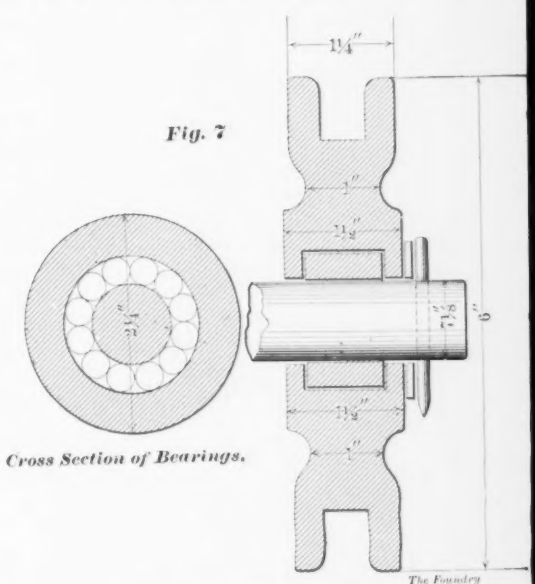
What they ask for is not greater speed in cranes, core ovens and tumbling barrels, but greater speed on the part of the operator himself.

I will match any of these critics against a Polack, unknown to fame.

If they will put up a large floor and carry more iron than the Polack I will acknowledge that I never knew what it was to work.

Where some foundrymen make a mistake is in trying to get something for nothing.

They will hire a good hustling molder for about three dollars a day let us say. The rest of the gang they will pay something like two and a half. The three dollar man gets the jobs to make a record. He does it. He



TAGGART CORE OVEN.

knows he must to keep his three dollars. After turning out all he possibly could on the job the rest of the gang are invited to turn out as many castings for two dollars and a half as the big fellow did for three. This is called pace-making and is one of the greatest sources of friction.

Instead of saying to the balance of the molders that they will be paid the same rate of wages if they do the same amount of work, an attempt is made to compel them to turn out the same amount of work for less money.

That shops following this plan should experience continual trouble is to be expected.

* * * *

A contemporary writing of a 55 ton bed plate recently turned out by the Allis Company, of Milwaukee, says:

"The casting was made from a pattern in a floor mold. About 60 workmen had every detail arranged for the crucial moment. Gas pipes stuck up from the mold by the dozen, to furnish escapes for the gases. When the word was given, the workmen lighted the tow at the end of each pipe, then four ladles were tilted and four streams of molten iron ran down the sluiceways into the mold. Another ladle of molten metal was picked up, craned into place and its contents poured out. While the metal was still flowing from the fifth ladle into the mold there was a sudden puff from the gas vents and the word that there was enough metal poured was given, and the casting was over."

It is very seldom that castings of this weight are made on the bench.

A copyright on the word sluiceways as connected with molding might possibly be obtained.

* * * *

The Doherty Iron Casting Process is dying of consumption. A petition for the compulsory winding up of the English company, which was formed with the object of demonstrating the benefits to be derived from squirting steam on the blast, has been made.

Those who were unfortunate enough to be induced to demonstrate the impracticability of the Doherty claims say that there is nothing like coke for melting iron.

* * * *

The following letter was recently received by a foundry which needed a foreman. It is a sort of an Ole Olson style the applicant uses to demonstrate that this and the other schop (job) can both be made on molding machines:

Dear Sirr!

I like to send a Letter to jou, and like to ask you for the Position as Formann in jour Foundry.

Dear Sirr!

I am a Man of 32 Jahrs of Age steady and sober. I been Molding for the last 16 Jahrs on Bench and Floor on Grey Iron and Malleable. I have made many experiments of both kind of Iron. I have run on of this Molding Maschine for 8 Jahrs. I can run most every Pattern no matter how a Pattern is on one of this Maschine. Ther is no Man can tell my this schop or the other schop can not be made on this Maschine. Wy not I can provet to him. I can tell jou houmany Molds a Man can put up for a days work and can tell him how mutch the schop is worth.

I been assistant Formann for 2 Jahrs in one Foundry to the time the movest away. In this Foundry I hat run the cupolo every time when the Molder was of and this was quite often. He was a Drunkard. Dear Sirr if jou think I can suit you let my no.

Bituminous Coal as a Cupola Fuel.

Between the period of the discovery of bituminous coal in this country and the introduction of the process of coking, there should have been, and no doubt was, a period when this coal was employed as a cupola fuel by some of the many small foundries located in the vicinity of these mines.

But there appears to have been no record kept of this coal as a cupola fuel by any of the foundrymen of those days, or nothing published in regard to it ever having been used for this purpose. That there should be no records of the use of this fuel is not strange, for nothing can be found upon the subject of any of the other cupola fuels, or mode of using them, prior to my work, "The Founding of Metals" (1877). Nor does there appear to have been anything published upon this subject in England or other countries prior to that date.

Twenty-five years ago I made inquiry among all foundrymen and molders in different parts of the country, as to the use of various cupola fuels in their early days. Many of them remembered melting with charcoal, before the introduction of anthracite coal and coke, in their locality, but only three, my notes show, remembered melting with bituminous coal.

Two of these were located in Western

Pennsylvania and one in Ohio, when melting was done with this coal without coking, but none of them had kept any record of the melting and were unable to give any practical data in regard to melting with it.

My own experience in melting with this fuel in a cupola has been limited to one cupola, that of Joseph King & Co., Sharon, Pa.

This company received their supply of cupola coke at that time from Pittsburg, Pa., by boat, on the Erie and Pittsburg canal; and it was their custom to lay in a sufficient supply in the fall to last until the canal opened in the spring.

In the winter of 1865 and 1866 their supply ran short and they were compelled to pay the high rate of a railroad that had just been opened the year before, look for other fuel, or shut down until the canal opened.

At that time the Sharon Iron Co. were using a very hard bituminous coal in their blast furnace without coking, and the foundry company were induced to try this coal in their cupolas.

The first heat with it was not a success. The iron melted hot and dull, fast and slow, and the greater part of it was so dull it had to be poured in the pig bed. But part of it, in different parts of the heat, was sufficiently hot and fluid to run light work. This indicated that the fuel would do the melting, but the cupola had not been properly charged.

For the next few heats, the charges of fuel and iron were varied with better results, and in the third or fourth heats iron was melted sufficiently hot and fluid to run stove plate and light jobbing work; and melting was done with this coal for a number of weeks, until the canal opened and they received a supply of coke.

This melting was done in a 28-inch cupola. A bed was put in of the same height above the tuyeres, and the charges of coal made of the same weight as when melting with coke. But the charges of iron on the bed and those on the charges of fuel were made lighter; and the ratio of iron to fuel reduced from 7 to 1 with coke to 5 to 1 with coal.

This is as good a per cent of fuel to iron as the majority of founders melting small heats in small cupolas obtain with the best of coke.

The quality of iron was not deteriorated with the coal, and it was not found necessary to make any change in the mixture to obtain as good a quality of iron in the castings as when melting with Pittsburg coke.

The coal used in this instance was very hard bituminous coal, and was said to be the only coal mined in this section that could be used in a blast furnace without coking, which was probably the case, for when the mine became exhausted the furnace began using coke as a fuel.

All bituminous coals are not available as a cupola fuel. Some are too soft, fuse into a solid mass, or burn away too rapidly when subjected to a strong blast, and others contain so large an amount of sulphur that they harden the iron and render it brittle.

In selecting a coal, a hard coal free frem sulphur should be chosen. When such a coal is not obtainable, small heats may be melted with a soft coal and a light blast, and sulphurous coals may be used for some lines of work by charging a better grade of iron than when melting with a fuel free from sulphur.

There are some sections of this country in which very hard bituminous coals are mined, that can no doubt be employed as a cupola fuel by small jobbing foundries located in districts where other fuels are very expensive.

DR. EDWARD KIRK.

A Premium for Efficiency and Steadiness.

During the period of exceptional activity through which the foundries of the country have recently passed, numerous complaints have been heard that molders would not work steady, that they were careless with their work, and were not sufficiently considerate of their employers' interests in this respect. Many of these complaints were no doubt attributable to the worry caused by the effort to turn out more castings than their plant was capable of in order to meet the extraordinary demands of customers. Carefulness and steadiness are, however, much-prized virtues in any mechanic. A man possessing them is a more valuable man to an employer, who knows when he gives him something to do that he will do his best to do it well, and knows also that he can depend upon him being at his post every day. He needs no days to get drunk and others to get sober; he gives his work his full attention during working hours and even though he be not the greatest "hustler"

in the shop he becomes recognized as the right man to keep when a lay-off is in prospect.

Our attention was recently attracted by the policy adopted by the Farrel Foundry & Machine Co., of Ansonia, Conn., to insure the best service from their employes. The superintendent, to whom we are indebted for the facts in the case, tells us that the eperiment was first tried upon the apprentices in the foundry, and was found to work so well that it was recently decided to apply the same rule to the journeymen. But the case is best stated in his own words. He says:

"I have been trying an experiment for the last two or three months in our foundry, which has proved very successful, and I thought possibly you might wish to recommend it in other localities for the welfare of the molder, and incidentally for the profit of the employer.

"Some time ago I tried the experiment of offering a special inducement to our apprentice boys for turning out good work, and I agreed that each apprentice boy who worked each day during the month, and during that time did not make any bad castings, should receive at the end of the month three days' extra pay,—these three days to count against the time to be served by the boy. In case the boy lost one casting during the month, we made him two days' allowance instead of three, and if he lost two castings, we made him one day's allowance instead of three.

"The first three months eight boys out of eleven did not lose a casting. We figured up the average loss from the work of the boys during previous months and found that we made a fair profit on this arrangement, and the boys were very much pleased with the plan. We are still using this plan, and we find that the boys take a great deal more interest in their work than they did before.

"We found this plan so successful with the boys, that two months ago we made a similar arrangement with the molders, agreeing to give every molder who was not absent during the month, and who did not lose a casting, one day off with pay, or, if he preferred to work, one day's extra pay at the end of the month.

"We found this plan to work to our advantage, and we think that the molders are very much pleased with it."

There is nothing of sniveling philanthropy about this proposition, for the superintendent comes out plainly with the statement that a fair profit was made by the arrangement. There is money in it for the firm as well as the molder who earns the prize. If the plan had no other effect than of minimizing absence it would be of value to the firm adopting it, for it is a well-known fact that a floor lying idle when there is work to be done upon it entails a material loss to the foundryman. Some objection might be raised to the time allowance made to apprentices, but when we reflect that were a boy to earn the three days' allowance for every quarter of his four years of apprenticeship, a thing which every one with a knowledge of the foundry knows to be absolutely impossible, it would only amount to forty-eight days in all, and there is no question but that a boy capable of earning any considerable portion of this time allowance would by that very achievement demonstrate his capability as a mechanic. Altogether the plan impresses us favorably. It offers a premium for efficiency and steadiness, and these are well worth cultivating for our own sakes.

[This article appeared in the Iron Molders' Journal for June, and we are advised by Walter Perry, superintendent, that the arrangement is still in force and proving of benefit to all concerned.—Ed.]

Corliss Cylinders.

The Corliss cylinder illustrated is of a type in which all working parts, valves, steam and exhaust openings and feet, are on one side of the casting only, which is not generally the case. These cylinders are made in sizes from 12" up to 100" in bore and weigh from 2,000 to 33,000 lbs. The sizes which are mostly wanted, however, are from 18" to 50", the others only being required occasionally.

Our average output of cylinders is about one a week and we are fairly equipped with a forty-ton steam traveler and several light jib cranes in the loam end of the shop and when required another traveler is at hand from the sand end.

The molds are rammed up in a bricked pit 30 feet square and 20 feet deep. The pit contains the sand, always in good condition,

for ramming up the molds with. Only one kind of loam is used for building and facing and for cores and when a casting is stripped, all the loam except that which is burned

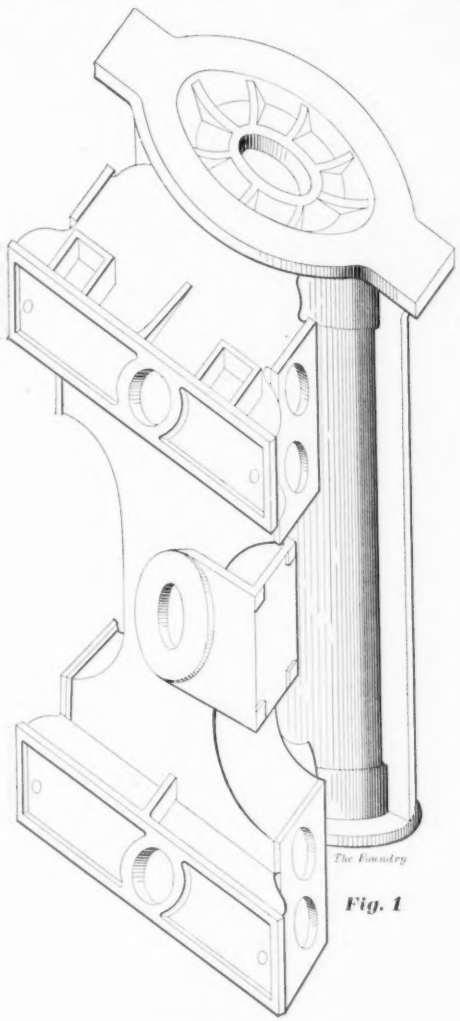


Fig. 1

CORLISS CYLINDERS.

black is used over again with an addition of red sand and dung. This makes an excellent loam which never cracks and sets quickly, so that a core roughed up in the morning and finished off at night is blackened on the following day.

Soft red bricks are used and also brick of half the ordinary thickness to save labor in chipping. The cylinders are never cased and no part of the mold is disturbed until the casting is cold. Three or four cylinders are always on hand in various stages towards completion. In molding these castings the men work in pairs, one bricking the mold and the other making tackle and core irons. The molds are all bricked from the floor level and are only lowered into the pit to be rammed up and poured.

Fig. 2 is a view of the cope with the drawback lifted away showing the arrangement of building rings and also the cast iron boxes bedded around each draw print in Fig. 4, D. These boxes serve to secure the cores in their exact position by placing iron against iron.

Fig. 3 shows drawback and method of han-

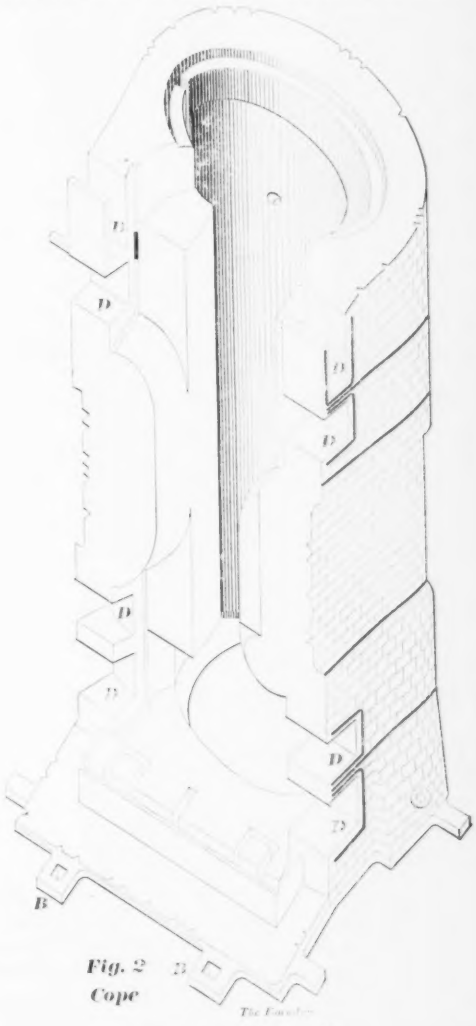


Fig. 2 Cope

CORLISS CYLINDERS.

dling it; the drawback is the full length of the cope and the joint is made in such a way as to give the least amount of fettling; no points are visible on a dressed

casting, as they are all edge points and pass over no surfaces.

The mold is blackened green and thoroughly dried and cored. The first core, Fig.

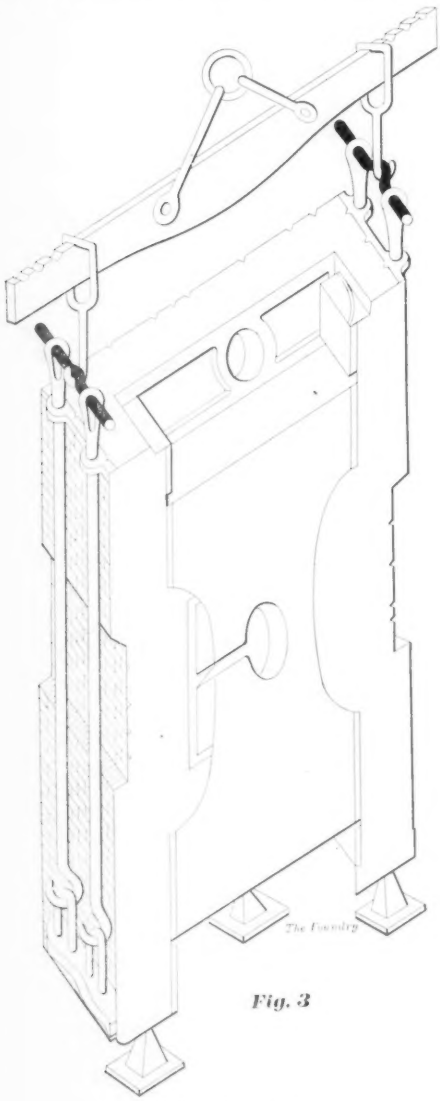
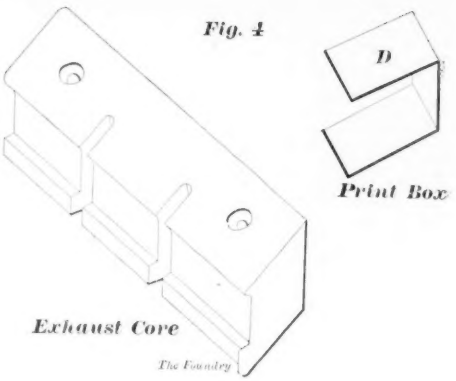


Fig. 3

5, is the steam core and is slid into its print and packed into its exact place by means of the "boxes" before mentioned. The valve cores are next slung into the mold in the same manner as the steam core. Fig. 6 is a valve core. No chaplets are used for securing these cores and the thickness of metal is easily noted, as it is nowhere hidden. The cores being set, the draw-prints are bricked up and the connections between

Fig. 4



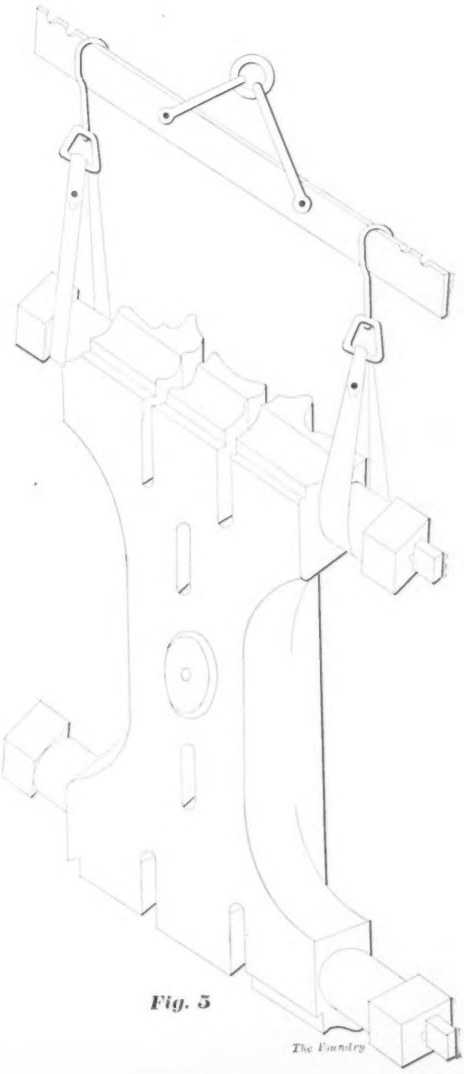


Fig. 5

the various cores are looked after. One exhaust core, Fig. 4, is butted against the bottom valve core in the cope, the other is placed in the drawback. The drawback is then slid on to its bearing and clamped to the cope, covering ring dropped on and the cope is lightly fired over night.

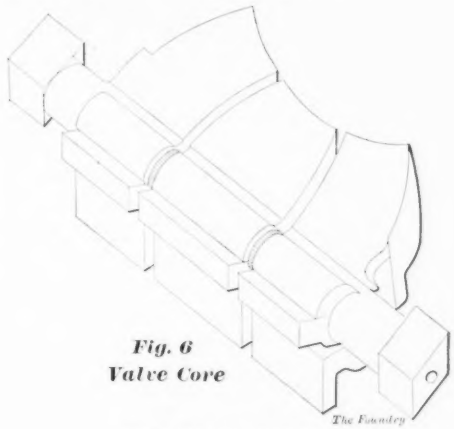


Fig. 6
Valve Core

CORLISS CYLINDERS.

The bottom plate, Fig. 7, is leveled and body core plumbed up and secured to the bottom plate by means of a T bolt as in the section Fig. 8. The cope is dropped over the body core and the mold is clamped, and two square bars are dropped into holes cast in snugs in the cope, B, similar holes being in the covering ring. The drawback is packed off these bars at intervals during the ramming up.

The mold is gated by six or more round gates, two onto the bottom flange, two or three about the center of the barrel and two near the top of mold, all gates entering the barrel at an angle so as to form a whirling

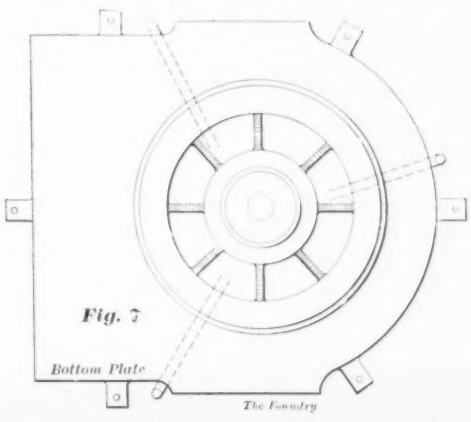


Fig. 7

CORLISS CYLINDERS.

motion and not strike the body core with too great a force. The entrance of metal into the mold is regulated by means of stoppers over the various gates in the runner.

The molds are rammed up in cast iron curbs 12″ deep 1″ thick and in sets from 4 feet up to 12 feet in diameter; when over 12 feet, segments are used. The black sand being in the pit, as the ramming up prog-

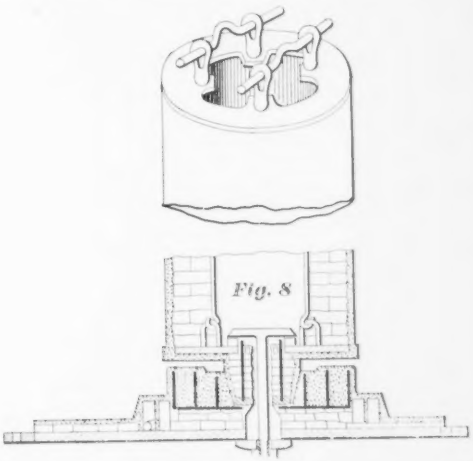


Fig. 8

CORLISS CYLINDERS.

resses the sand is thrown up into the curbs by the laborers, who attain considerable precision, throwing the sand twelve feet high into the curbs and seldom missing their goal. After the mold is poured and the runner broken up, the curbs are hoisted off with the crane, and the sand cleared from round the mold. On the following morning the cylinder is hoisted out of the pit and run into the cleaning shop, leaving the pit ready for another cylinder.

GEO. BUCHANAN.

Youngstown is Not so Slow.

A Milwaukee correspondent says: Probably the largest casting ever made in the country was run into the molds yesterday at a local foundry. The casting is to be the bed plate for a blowing engine for a Pittsburg concern and it weighs 116,000 pounds, all in one piece.

The casting is 2,000 pounds shy of the largest ever made in this city. William Tod & Co. cast a 112,000 pound bed plate for a blowing engine at the Ohio steel plant.—Youngstown (Ohio) Telegram.

Shot Iron—How to Recover it, and How to Use it.*

BY E. H. PUTNAM.

In most foundries there is going forward a constant and heavy waste of iron, day by day, year after year, while, strange as it may seem, the founder is in many cases totally unconscious of the fact; and those who realize that there is a waste, are in entire ignorance of its magnitude. We have been taught that the small particles of iron that escape from the tumbling mill, and are thrown out with the refuse are not, in any true sense, waste; for, it is claimed, this iron is of no real value, as it will not mix, and it has a hardening effect upon the mixture.

I have recently learned that there is a much greater quantity of iron thrown away than I had suspected, and that, though it does harden the mixture to some extent, this is not sufficient to preclude the possibility of its economical consumption. I am aware that some writers on foundry practice aver that there is no economy in using it; that, as noticed above, it hardens the mixture, and that, also, much of it is burnt up, and so destroyed. While it is quite probable that some of the very thin, light particles are indeed consumed in the remelting, it is, nevertheless, certain that the greater part melts and mixes with the other iron. This I know, for I have tested the matter by melting a quantity by itself, weighing it into the cupola, and afterwards weighing the product, the latter being 90 per cent of the amount charged. The shrinkage in some kinds of pig iron will equal this.

Our method is as follows: We pass the cupola cinders through the tumbling mill (as has always been our custom), continuing the tumbling until the cinders are thoroughly crushed, and everything but the iron has sifted out between the staves, which, in our practice, fit rather closely, for the purpose of saving as much iron as possible by this process.

Now, the refuse dust and fine cinders, which formerly was dumped out, as being entirely worthless, is passed through the magnetic separator; and the amount daily recovered from the dump of two cupolas is something in excess of 550 pounds of iron, which will yield 500 pounds after sifting, or 450 pounds after remelting. The product, when melted by itself, is a strongly mottled pig. But, as this shot iron is distributed throughout the heat, as mixed in the daily cast, its hardening effect is very slight, and, in a well ordered mixture, cannot be detected in any but very light, thin castings.

But you cannot use this shot iron in all mixtures, any more than that you can use certain pig irons in all mixtures. If you are going to use the shot iron regularly, the pig mixture must be regulated with this fact in view.

When we first began using this shot iron, we had some No. 2 soft charcoal iron which we were using in the regular soft iron mixture, and we had no trouble whatever. Later, the charcoal iron having been all consumed, we made a mixture of all coke iron, employing, of course, the usual quantity of scrap (50 per cent, which includes our shop remelt), with the result that the light castings were altogether too hard for drilling. There were but few of these castings made, and they were thrown into the scrap.

In the process that I now immediately began, and prosecuted to a conclusion, may be seen the method of a branch of the "rule of thumb" foundry practice.

The shot iron was left out entirely, and the balance of the mixture made as before. A few of the light castings only were made, and these were cast at different parts of the heat. Result, too hard for the light castings that had to be drilled, but all right for the balance. There were three different numbers of pig iron in the mixture, viz., No. 2 soft, Southern; No. 2 foundry, Southern, and No. 1 Northern. The two former were from an unfamiliar furnace. So the per cent of No. 2 foundry was diminished, with good result. Cutting down of the No. 2 foundry was continued until that brand was entirely eliminated, and, even then, the product was not so soft as to enable the use of the shot iron in the light castings. During the process we had also changed the per cent of No. 1 iron in the mixture, to correct shrinkage. The loss consequent upon the "rule of thumb" method of correcting our mixture, would amount, in money, to very little.

Now, we omitted the shot iron from the

*Paper read at a meeting of the Foundrymen's Associations.

first 7,000 pounds charged in the cupola, which enabled us to cast the light work before the mixture containing the shot iron came down.

As the No. 2 foundry iron was too hard for our use, except in the heavier castings, we bought from a different furnace; and now we are again using the shot iron without difficulty.

We have had no difficulty consequent upon the use of the shot iron, except in the matter of hardness. To overcome this, it is only necessary to use a sufficiently soft pig iron in the mixture. We have not been obliged to use any specially soft iron in the mixture—just ordinary No. 2 soft, No. 2 foundry and No. 1 foundry—the same brands that we were using before we began melting the shot iron.

The actual saving in our case is, say, 450 pounds of iron per day, @ 67c $3.00 per day.

The time consumed in operating the separator must be considered, of course; but this is so trivial that no additional labor is employed, the work of running the separator having been added to the duties of the laborers who work about the cupola.

The magnetic separator that we use is one that Messrs. Barnard & Leas, of Moline, Ill., invented and perfected during the past year, and which they are now manufacturing for the trade. I do not wish to make any invidious comparisons between this machine and other machines manufactured for the like purpose; however, a general description of it may not be out of place.

The machine is, essentially, in shape a cylinder, wound with copper wire which, in operation, is charged with electricity. This cylinder is set in the frame at an incline that will cause the cinders to pass through, from the one end where they are charged, out at the other, the magnetized inner surface of the cylinder catching and holding fast every particle of iron. It might seem, at first thought, that some of the iron particles would get brushed out with the dust and coke cinders; but it should be borne in mind that the iron in contact with the cylinders is itself magnetized, and therefore holds firmly any iron that comes in contact with it. When the current is thrown off the iron "lets go" from the cylinders and pours out into the receptacle. The work of operating this machine is as simple and easy as running a power sand sifter. Cost of current for the machine is less than two cents per hour, and one hour's labor will run the day's product through.

The machine weighs about 1,100 lbs., and occupies a floor space of 2'6" by 10'.

In conclusion, I wish to state that the saving effected by us is less, by a good deal, than what it would be in foundries where extraordinary care is not taken to extract the iron from the cinders, by having close-fitting staves in the cinder-mill. In fact, it is quite obvious that, in view of the difference in the care taken in various foundries in this respect, the saving by the use of the separator in some foundries would be two or three times what it is with us.

One very important point to bear in mind is that, no matter how large or how small the pieces of iron, none can escape the vigilance of the machine. So that, if the operator of your cinder-mill becomes careless, permitting wide spaces between the staves, which will pass large pieces of iron, that would ordinarily go to the dump, the magnetic separator will catch this iron and save it for you.

It is our intention to provide wider spaces between the mill staves, so as to obviate the necessity for so much grinding in order to reduce the cinder. This will save somewhat of time and wear of machinery, without any loss of thoroughness in the extraction of the iron.

Machine Molding.*

We are all more or less familiar with the various types of molding machines that are now being offered on the market, and many of us are familiar with machines that have had their day and been discarded. It is not always a question of installing a machine that will do a given work. What we are most interested in is machines best adapted to the individual requirements of our foundries. In other words, we want to know what machines will enable us to produce the best quality of castings at the least cost, and at the same time place us in the most independent position with respect to labor.

In order to consider the application of molding machines to foundry work, let us

*Paper read by I. L. McCord at a meeting of the Foundrymen's Associations.

analyze the work of molding into the following five principal operations:

1. Getting the flask, pattern and match board together and putting in the sand.
2. Ramming or compressing the sand.
3. Removing the pattern from the sand.
4. Placing the mold on the floor.
5. Pouring the melted iron into the molds.

Of course in addition to these five operations is the riddling of sand, the application of facing to the molds, shaking out, etc., which for the present we will assume to be practically the same, whether the molds are made by hand or on machine.

It is principally for the purpose of reducing the cost of the five operations mentioned that molding machines have been invented, and it is obvious that the machine which will effect the greatest saving in the aggregate during these entire five operations is the most desirable machine, quality of work, of course, duly considered.

It is a comparatively easy problem to devise a machine which will effect a saving in one or two of these five operations. For example, on certain classes of light work patterns may be attached to metal match plates, so that they are at all times together in convenient form to set into the flasks, which may be stacked near at hand, and thus effect a saving in the first operation. Again, a machine can be readily constructed so that, regardless of the other operations, it will effect a saving in the second operation, that of ramming the sand. Likewise stripping plates facilitate the removal of the patterns from the sand. The molds may also be conveyed in some manner direct from the molder to the cupola for pouring, and a saving thus effected in operations four and five. But to effect a saving at one point without increasing the cost at some other point is the perplexing question.

WHERE TO REDUCE COST.

Molding machine makers have not always agreed upon the proper point at which to undertake to reduce cost. Some of them have taken the position that the greatest saving can be effected by ramming the sand automatically and rearranging the remaining operations to accommodate a machine for power ramming. Others have gone a step further and combined stripping plates with power rammers. But it has only been on certain special classes of work that such machines have been entirely successful. It must be admitted that there is some work where the ramming of the sand is the biggest part of the job, but aside from very light work or very heavy work it will be found ordinarily that the drawing of the pattern and the work incidental thereto consumes by far the greater portion of time, besides requiring the greatest amount of skill.

A few years ago I visited one of the leading foundries in Philadelphia and recommended a stripping plate molding machine for large gear wheels, on which this foundry runs one or two floors pretty much the year around. During my interview with the proprietor and foundry superintendent they challenged my statement that the machine which "merely drew the pattern" would enable two men to put up 40 of these gears per day, against 12 which a molder and helper were putting up at that time. To prove the point we went into the foundry and timed the men, finding that it took 35 minutes to complete a mold; exactly seven minutes of which time was consumed in shoveling sand into the flask and ramming up the mold; the remainder of the time was expended in drawing the pattern, patching and slicking the mold, etc., showing that in this particular instance the handling of the sand and the ramming consumed about one-fifth of the entire time spent on the mold. This was perhaps an exceptional case, because the gear was rather a difficult pattern to draw without breaking the corners of the mold, but it serves to call attention to the fact that foundrymen may be unaware of the precise conditions regarding a given pattern unless they have made a careful investigation and noted the various stages of the work incidental to molding. On the gear in question, if 75 per cent. of the labor of ramming the mold could have been saved, it would only have saved 15 per cent. of the total cost of molding the gear.

EARLY POWER RAMMING MACHINES.

The first successful molding machines introduced into this country embodied the simple stripping plate principle. It is true they were crudely constructed and designed to receive only the simplest of patterns, but the stripping plate principle began to be recognized as the best means of securing a clean, clear cut mold, although the lack of experi-

ence in the preparation of the special patterns required for such machines prevented a very general introduction of these machines throughout the country. Some of the larger foundries built and installed these simple machines and immediately began to devise some scheme for pressing the sand into the flasks. From that moment development of machine molding along practical and simple lines received a severe set back. Several prominent manufacturers put upon the market about the same time large steam actuated or pneumatic machines, and in fact the poor little simple stripping plate machine was entirely forgotten in the efforts of these manufacturers to construct machines designed to entirely dispense with molders. No doubt most of the gentlemen present whose experience dates back 15 years will recall one or two of these systems with which their sponsors proposed to revolutionize foundry methods. At that time the power ramming molding machines had reached their zenith and the audacious claims made for these machines were only equaled by the complacency with which their manufacturers demanded fortunes for installing them. Many of the large agricultural implement concerns installed these systems, comprising large power ramming molding machines in connection with conveyors for automatically handling the sand and flask to and from the machines. Ingenious platens were devised to insure uniformity in ramming, and withal these systems were most elaborate and complete. You remember them? To-day these machines are scarcely ever seen except now and then in an antiquated foundry, where they give testimony to the utter failure of a beautiful theory. Many of the same foundries that installed the systems mentioned went back to the simple machines, and are now using stripping plate hand ramming machines, which enable them to turn out a far greater tonnage to the number of men employed than they could possibly have done or did do with their power ramming machines.

Edgar Penney, general superintendent of Frick & Co.'s large works, at Waynesborough, Pa., discussed before the twenty-first meeting of the American Society of Mechanical Engineers, held in Cincinnati in May, 1890, his experience with what was probably one of the best power ramming molding machines of the day, wherein the patterns were divided in halves and placed on either side of an iron plate, the flasks being provided with trunnions. In operation the plate was clamped between the two parts of the flask, the whole being placed on a counterbalance platen with the cope side up. The sand was shoveled into the cope and the top platen forced down against the mold by mechanical means. Upon raising the top platen and also the flask on its trunnions by means of a foot lever, the mold was turned over by its own gravity, the operation being repeated on the drag part of the flask, and the mold then passed to a molder, who separated the two parts of the flask, removed the plate with its patterns, closed the mold and passed it on to be deposited either on the floor or on a conveyor which carried it past the cupola for pouring. Withal this machine appeared to be exceedingly simple and rapid of operation, and undoubtedly accomplished in a satisfactory manner the purpose for which it was intended—namely, ramming the sand. In comparing results obtained from this machine with hand work, it appears that a molder and a boy put up 33 snap flasks per day on the bench. With the machine one man and two boys put up 168 molds. The entire saving thus effected was directly attributed to ramming the sand on this machine. Nothing was said by Mr. Penney of the cost of bringing the sand up to this machine or the cost of taking the sand away from the machine and depositing it on the floor, and nothing is said of the amount of skill required on the part of the man who removed the plate and pattern from the mold. We could show you hundreds of cases where a much greater output has been reached by simple hand ramming stripping plate machines, which do not require the sand to be brought to them, and in fact require no extra handling of sand and flasks beyond what would be necessarily required if the molding were done by hand.

I know of a malleable iron foundry making railroad draw bars on a machine with a large revolving table for conveying the molds around to a convenient point for pouring, and with power ramming devices for compressing the sand. This foundry has accurately figured that it costs them just 2 cents apiece more to mold their draw bars on this

machine than it costs to mold the same draw bars on the floor by hand, and their only apparent reason for continuing to operate the machines is to get more uniform castings. Whether the machine accomplishes this result in a satisfactory manner I have been unable to ascertain.

HAND RAMMING STRIPPING PLATE MACHINES.

I know of a foundry making railroad brake shoes on a well-known type of molding machines, wherein the machines draw the patterns through stripping plates, and the molds are rammed at one stroke by compressed air. This foundry is about 75 feet wide, and the molding machines are arranged in a row about 15 feet from one side of the building. In operation two men work at the machines while one man works on the floor setting cores and inserts and closes the molds. The floors are started near the opposite side of the foundry from the machines, and the first molds are carried by the machine operators a distance of nearly 60 feet. As a result of the time consumed in carrying the molds away from the machines this force of three men in ten hours' continuous operation are able to place on the floor 330 molds, or 110 molds per man. This same foundry installed some hand ramming stripping plate machines a few years ago, fitting up for them precisely the same patterns as those on the pneumatic machines. The hand ramming machines were operated by two men, who were able in ten hours' continuous operation to place on the floor 225 molds. It will be seen, therefore, that practically the same output was obtained from the hand ramming machine per man as from the pneumatic machine. The castings made on the hand ramming machines, however, were cheaper, because the pneumatic machines consumed a considerable amount of compressed air, and also required a considerable amount of repairs for the reason that the enormous pressure required to ram the molds on the machines racked them to pieces very rapidly.

There is a foundry near Cleveland in which large quantities of drop hangers are made, some on pneumatic machines and others on hand ramming stripping plate machines, and this foundry has figured that the same output practically can be obtained from the hand machines as from the pneumatic machines. I know of one or two other foundries making drop hangers, boxes and similar work that have discarded pneumatic machines and installed hand ramming machines.

One of the large manufacturers of pipe fittings in Chicago has in use a very elaborate system of machines and conveyors which for their particular class of work has proven quite successful, yet these people have for some time been investigating other systems, and it is a question whether they are now producing their castings at a less cost than others who are equipped with ordinary stripping plate molding machines.

There is a foundry near Pittsburg which has had in operation for a number of years a very complete system of machine molding, a system which has been looked up to by founders everywhere as a model of its kind. Yet the general manager of this company recently assured me that if they were now for the first time putting in molding machines for their work they would probably not install a system such as they at present operate.

Of course it may be argued that the particular instances herein cited do not fairly condemn power ramming machines, since there may have been especial conditions which in the arrangement of the machines and their operation prevented the attainment of the best results. But it should be borne in mind that the conditions in these foundries under which the power ramming machines were operated were precisely the same as the conditions surrounding the hand ramming stripping plate machines. We do not contend that power ramming machines are a failure in all respects. A great many foundries are using them to-day, and producing large quantities of castings of good quality, and at a less cost than the same castings could be produced by hand. But we have yet to find a single foundry that is producing castings as cheaply on power ramming machines as the same castings can be produced on hand machines. We submit, therefore, that in the face of such testimony we are justified in claiming the superiority for the hand ramming stripping plate machines. We are giving you not alone our views, but the experience and judgment of those who have made a careful and thorough study of machine molding for years.

DISADVANTAGES OF POWER RAMMING MACHINES.

A power ramming machine must of necessity remain in one position, or on one fixed foundation. Therefore, without some accompanying scheme for handling the molds to and from it, the machine will frequently cost more to operate than it will save in the one operation of ramming the sand. It is, of course, a very difficult matter to arrive with any degree of accuracy at the amount of the increased handling of sand and flasks which may be properly chargeable to the machine, especially where several machines are being operated at the same time and are turning out different kinds of castings. However, it is a pretty safe proposition that it costs more to move a ton of sand a given distance than it does to move a ton of iron, no matter whether it is wheeled in a wheelbarrow, carried on the back or conveyed by automatic carriers. It certainly costs very much more to move sand and flasks from the floor to the machines and back again in the form of molds to the floor or cupola for pouring than it does to move the machines along with the work and convey iron one time from the cupola to the floor.

Another point upon which we believe the makers of power ramming machines are pursuing the wrong track is in their endeavors to secure uniform ramming of the molds. If we have a machine that will successfully ram the sand in a mold uniformly we have a machine which is limited in its uses, because there are only certain patterns with which the best results can be obtained by equal pressure. It is not uniformity that we need. The unequal pressure of the fluid iron against the walls of the mold, the irregular surface of the casting, and the varied thickness of the different sections of the casting, the iron setting much more rapidly in some sections than others, and requiring less density of the sand to admit of the free and rapid escape of gases, are one and all conditions which must be met by the exercise of a molder's knowledge. These are some of the very things which a molder must master before he becomes proficient at his trade. We claim, however, that the hand ramming stripping plate machine may be adapted to any pattern which it is possible to mold by hand, because the machine permits the exercise of the same degree of intelligence that is necessary in making molds by hand. We do not mean by this that the stripping plate machine requires at all times a competent molder to operate it. The stripping plate machine goes further. It enables men of ordinary intelligence to very quickly acquire the amount of skill which is necessary to make molds. The utility of the hand ramming stripping plate machines lies in the great flexibility of the system. There is practically no limit to the range of work which can be made on such machines, and the limit is only reached when ingenuity is no longer able to devise a scheme for attaching the patterns.

THE INITIAL COST OF STRIPPING PLATE MACHINES.

One great objection that has been raised to stripping plate molding machines has been on account of the initial cost of the patterns and stripping plates. These cost money, as we all know, but since they have proven to be better and to enable the production of better castings and cheaper castings, the first cost ought to be compared with the results. We do not believe that a machine of any kind can be too good. You might install a traveling crane in your foundry and save a great deal of the initial cost by omitting one of its motors and arranging to haul it back and forth in your foundry with a cable and a team of horses, but you will not think of doing such an absurd and idiotic thing. If your work requires the addition of a traveling crane you want the most modern tool that you can buy with the highest practical speed and greatest reliability and $500 or $1,000 in the original cost will not prevent you from having it. From this same standpoint, if you have quantities of castings that are duplicated to an extent to require molding machines at all, you cannot afford to operate any other than the best machines your money can buy. If your castings do not run into sufficient quantities to warrant the expense of stripping plates then from an economical standpoint you had better make them on the bench or floor.

MANNING THE MACHINES.

I have seen instances where satisfactory results have not been obtained from stripping plate hand ramming machines, and it was usually not difficult to trace the cause of failure to its true source. I recall one instance where a set of machines went into a foundry

and about four weeks thereafter the superintendent reported that he had been unable to make much progress with the machines, and in fact could not begin to turn out the amount of work that had been represented. Upon investigation it developed that the first week the foreman had placed two men on the machines, whose only experience around the foundry had been unloading pig iron and wheeling sand. The result, that might have been expected, was that about 50 per cent. of their work had to be scrapped.

The next men put at the machine did but little better, and then the foreman related how in desperation he had "finally put the best molder he had in the shop" at the machines, and while this molder had done excellent work, he had failed to put up any more flasks on the machine than he could have done by hand. Here we have had a complete explanation of that foreman's failure to make a success with his machines. Green men should always be under the direct and careful supervision of the foreman personally until they learn their job. It will not do to leave them to the tender mercies of their own ignorance nor to the wily persuasion of the molder who may be working on the next floor. Our experience has taught that the best men to put at molding machines are helpers who have some knowledge in a general way of foundry work, and who are endowed with sufficient intelligence and memory to do precisely as instructed. They should have minds of their own, and they should appreciate that it is a promotion for them to be put at the machine Doing a general jobbing business there are times when we have no orders running into quantities. At such times we use our machine operators at ordinary laboring work and pay them $1.50 per day. When we get an order for a few hundred castings of one kind we fit up the patterns for machines and these men are always ready and waiting for such jobs, and usually ask the foreman in advance if they can have them. When operating the machines the men are able to earn more wages than they otherwise could, as we put them on piece work, and so find that we are seldom bothered about getting men to operate our machines.

THE QUALITY OF MOLDING SAND.

I have seen some instances where hand ramming, as well as other molding machines, have not been entirely successful on account of the peculiar qualities of molding sand used. It may not be apparent at first thought that sand which might answer the purpose in hand molding would not work equally well on molding machines. But if you will bear in mind that a molder at the bench or on the floor can roll his flask over, and always lift his pattern up out of the sand, whereas on a molding machine the pattern is usually drawn down, it will be seen that the sand for machine molding ought to have the greatest possible bond. It also sometimes happens that the quality of the sand may be satisfactory and that the tempering and mixing, having been done by the same green and inexperienced men placed upon the machines, is at fault.

Toughness and porosity, the chief requirements of good molding sand, depend equally upon proper mixing and uniform ramming. If the mixing and tempering of sand is left entirely to inexperienced laborers rough castings with uneven surface may result from this source, instead of from the quality of the sand or improper ramming of the mold. Therefore, in order to obtain the best results in machine molding, wherever it is possible mechanical mixers ought to accompany the machines. There are several good sand mixers on the market and they are inexpensive.

THE PNEUMATIC SAND RAMMER.

I have mentioned some of the popular objections to hand ramming machines, but there is another and far greater objection that has been raised in almost every foundry that has installed this type of machines. If you will go into foundries like that of the McCormick Reaper Company of Chicago and watch the men at work on hand ramming machines, you will wonder that they are able to stand up to the machines for a whole day and turn out the quantity of work which you see them putting on the floor. It is a fact that the man's job who is unloading pig iron is a sinecure as compared with that of the machine operator. In order to meet this objection to the hand ramming machine we have devised a pneumatic sand rammer to be used in connection with our machines, which enables the machine operators to exercise the same degree of intelligence in ramming their molds that they can when using ordinary hand rammers. This rammer combines both butt and pein ends, and in operation

can be reversed at pleasure for tucking around the corners of the mold as well as "butting off." This rammer will not only enable the operator to ram up from three to four times the amount of flasks that he could by hand, but it leaves him about as fresh at the end of his day's work as he was at the beginning; since the only energy he is called upon to expend is in guiding the machine and directing and controlling the blow.

The hand ramming stripping plate machine has proven itself to be the best molding machine for all around purposes, and we submit that in connection with the pneumatic sand rammer this equipment represents the highest standard of efficiency as well as the most modern development of machine molding. Of course, all foundries are not equipped with air, but most foundries that make sufficiently large quantities of castings to justify the use of molding machines have compressed air plants.

There are many questions that have been discussed in connection with molding machines, such as the division of labor—that is, having one force of men operate the machine all day, and another gang do the pouring. We believe these are matters that can best be adjusted by foundries individually. In many instances it is no doubt more economical to have a separate gang of men for pouring. In most cases, however, where you are trying to get along with laborers for molding, we think it a good plan to have them pour their own work. There are not so many men to educate, and besides the relief from the monotony of molding on the machine is a good thing for the men. They will feel themselves capable of doing more than one thing and will take more interest in their work. The fact that they may sit around a few minutes after the blast goes on is not going to count against them. They will not do one whit more work in a day without that little rest than with it. There are some progressive factories in other lines of business that give their employees 15 minutes, recess both in the forenoon and the afternoon, which takes a half hour out of their working day, but they consider it a good investment. And I do not believe any foundry will lose money by allowing their molders a short "breathing spell" from the time the blast is put on until they get their iron.

As stated, however, we do not believe these are matters which necessarily belong to a discussion of molding machines.

Power Ramming and Stripping Plates.

Referring to the paper on "Machine Molding" read by Mr. I. L. McCord before the Philadelphia Foundrymen's Association, we have received the following communication from Mr. E. H. Mumford, of Elizabeth, N. J.:

Editor THE FOUNDRY:

Mr. McCord questions the economy of power ramming and defends the expense of stripping plate patterns on molding machines. I had not thought a discussion of what seems a self evident proposition would be necessary in reply to Mr. McCord's paper, until our correspondence began to include letters, asking how we dared to recommend power ramming machines, in view of Mr. McCord's statement that they were not good things to buy. I can perhaps take up this question with less prejudice as the company with whom I am connected build both hand and power ramming machines.

There are three combinations possible in what are called molding machines:

1. Machines which ram.
2. Machines which draw patterns.
3. Machines which do both.

In an advertisement in THE FOUNDRY, attention is called to the fact that probably the first molding machine ever built was a hand ramming stripping plate machine, patented in 1800, and a logical conclusion would be that the world had moved since that time. More recently, molding machines (so-called) have been installed in malleable iron and other foundries by the thousand, which have done nothing but ram the molds. These are called "squeezers," and it is well known that the simple introduction of these ramming machines has resulted in a large saving. Carry this one step further and save a man's strength while the machine rams the molds.

To ram the ordinary size half mold, say 14 inches square, requires perhaps 500 foot pounds of work, done as the machine does it. A molder carrying his rammer up and down, back and forth, with many unnecessary motions, possibly doubles the amount of work a machine puts into the sand. It should need no argument to show that this labor is worth saving; in fact, Mr. McCord himself proceeds to advocate this by the in-

troduction of the separate pneumatic ramming, which is undoubtedly a good thing in its way, but that power ramming, per se, is worth while is shown by the fact that we are at present crowded with orders for machines which are nothing but plain power squeezers, in addition to our regular output of more complete machines.

All proofs in molding machines (as in puddings) are made when they are tried, and here's a parable: A pair of hand ramming stripping plate machines were once tried for six months, and did very well indeed; then the man who had tried these good little machines tried for one month a power ramming vibrator machine; result of one month's contrast—a lump order for 20 power ramming vibrator machines. As to the use of portable machines, it is not true that power ramming pneumatic machines are necessarily stationary.

It is not strange that the same paper which deprecates the saving of labor of ramming should also advocate the unnecessary expense of stripping plates. Vibrator machines, as they are built, are more rapidly made into stripping plate machines in a simpler manner than machines of any other type, but it is seldom necessary.

To say that unless a purchaser of molding machines can afford to incur the expense of stripping plates he had best not to buy the machines is like advising a man not to go to housekeeping unless he can buy a piano. There are other things more necessary to his domestic menage.

There are foundries in this country which are burdened with an investment of about half a million dollars' worth of stripping plate patterns, probably two-thirds of which might have been saved by the use of vibrator machines in one form or other. Take for illustration a certain class of work, the pattern costs are about as follows:

Metal stripping plate patterns, properly made—i. e., without babbitted edges, which lap and grind the expensive patterns—$70 per set. Equally perfect metal split patterns, mounted on vibrator plates, $22 per set. The same work, split wooden patterns on wooden vibrator plates, about 25 cents in addition to the cost of the pattern. Complete gated patterns on vibrator frames, no additional cost for patterns whatever, when the saving of wear and breakage in handling is counted in.

So much for pattern cost—now some figures as to power ramming.

Mr. McCord quoted 225 molds of brake shoes from hand ramming machines operated by two men in ten hours as a maximum output. For years a certain shop has molded with one man on a power ramming machine 140 flasks in eight hours. This is not a test of maximum output possible, but a regular day-in-and-day-out production, running through a good many years, and shows a saving over the hand ramming figures quoted by Mr. McCord on the same work of over six molds per man per hour, due to power ramming. This man, as I presume in Mr. McCord's instance, shovels his sand from the heap, sets two cores in each flask, closes and clamps ready for pouring.

I have written more at length than I intended, but plead as an excuse justice to builders of machines which ram molds by power, and to manufacturers who are using, or contemplate using, such machines.

E. H. MUMFORD.

Keeping His Men.

E. H. Hargrave, president of the Cincinnati Tool Co., in a recent interview in a Cincinnati paper, spoke as follows on the problem of keeping hands in a factory any distance from the center of the city, declaring that the matter resolved itself down to a steady operation of the factory. "A factory that is run about even all the time," said he, "will find no difficulty in keeping its hands. If a workman is sure of 60 hours of work a week, then he will follow the factory and will be interested in its success. If a factory runs clear up to its capacity one day, drops off half of its force a few days after and possibly later on closes down for a week or two, only to start up on another spurt, then the concern may expect to have a hard time in keeping men. We have looked into the problem and have no fear that we will have any difficulty in keeping our men with us."

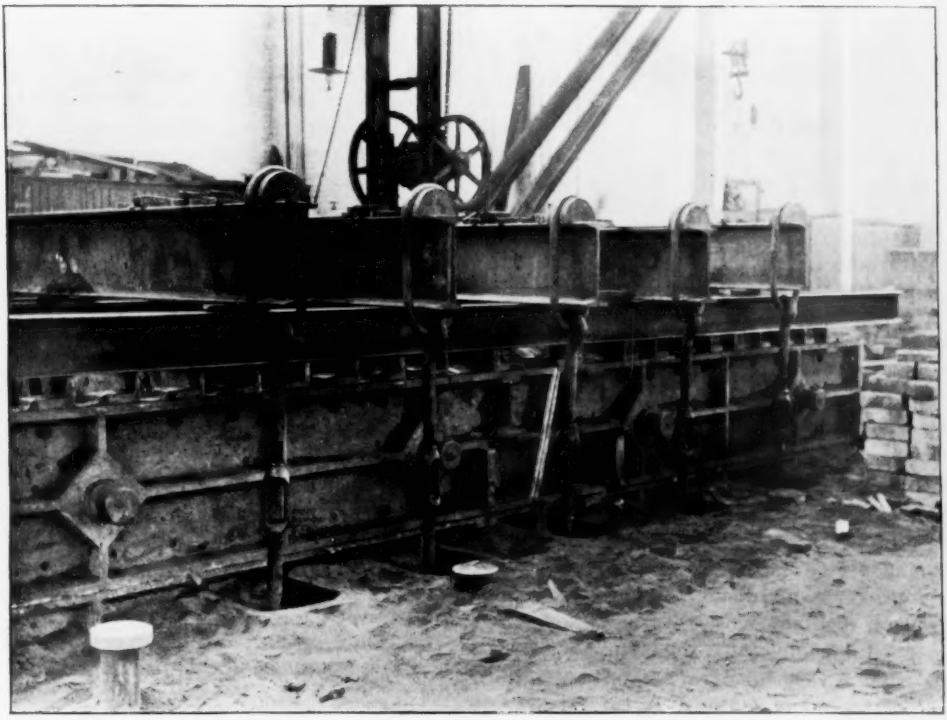
Mudding Her Up.

The college foundry has been busily engaged in getting out castings for machinery under construction in the shops, and the cupola will be relined by students after the next heat.—Manhattan (Kan.) News.

Well Done.

In our December issue we illustrated some points of interest at the foundry of the Westinghouse Machine Co. at East Pittsburg, Pa. On page 144 of that number was shown a section of the cope for a rather large casting with the cores suspended therefrom. Our illustration gives a fair idea of the appearance of the mold when completed.

The workmanlike manner in which it is secured appeals with special force to the practical man. While this is a very large mold, there is a noticeable absence of that clumsiness which is too often associated with jobs of this kind.



METHOD OF SECURING LARGE MOLDS AT THE FOUNDRY OF THE WESTINGHOUSE MACHINE CO., EAST PITTSBURG, PA.

Serving His Time.

Working around in the different shops, a man meets a large variety of workmen and hears and assimilates a lot of useful information regarding the different opinions of men upon one subject that has borne a great deal of discussion, and to which there are two sides—that is the advisability of a youth with mechanical ability and a natural liking for mechanics staying where he has served his time; or, in fact, staying there long enough to master his trade. The two sides, according to my own ideas, and also to what I have heard, are these:

First, taking the affirmation of the proposition, the benefits derived from staying in one shop are these: In the first place, after the youth becomes accustomed to the work and gets on well with the workmen and also stands in with the foreman—naturally, if he is at all bright, he learns fast; first, through feeling at home, and second, through the help of the workmen, putting him onto all the kinks. After that he gets so he can do most anything around the shop if he has been given a fair show; serves out his time; and at last is rated, after a lot of worrying and coaxing, as a first-class workman. Then there are two paths open for him: One to stay where he is and watch and wait, and, perhaps, after years of toil and trying, if he is lucky, be given a position as foreman of a gang or a floor. There he

sticks, and he is rated as being the lucky one.

The other path is this: Let us suppose that one day he gets the "spring" and quits, and strikes out for himself and another job. He secures one in a shop, manufacturing a line different from what he has been accustomed to. He goes to work and is surprised to find the work being done by entirely new ways and different tools from what he has been used to. New wrinkles! and, of course, as he hired out as a first-class man, he can't expect to be instructed, and as a rule, unless he has lots of confidence and a firm determination to stick, quits work or is laid off.

On the other hand, take the youth that has worked a few years as a start in one shop, gets the hang there, then strikes out, say in New York City, where the variety of shops, works and ways of doing work are greater than in any other city in the Union. Say his first has been a manufacturing shop; his second, an all-around jobbing shop, where they do anything they can get through the door. Here he has the chance to become self-reliant; learns to forge his own tools, something he would never do in a large manufacturing shop; does a larger variety of work in a month than he did in the two years in the other place. After staying and learning all he can here he gets out and tackles a brass shop where they make all their own tools. Here he gets his start as a tool maker. With a good foundation as a machinist to build on, he takes hold right away, becomes proficient on all kinds of tools and fixtures for the working of brass, of which there is a large variety. By this time he commences to know something; then he keeps on going from here to there and stowing away knowledge, keeps up to date, getting on to all the new wrinkles, so that when he has reached the age of 25 or 30 he is known as a good man. He has confidence in himself and is not afraid to tackle anything that comes along. Why? Because he is not tied down to one system, but through association and experience, is on to them all. Now, if the right opening comes along he can drop into it gracefully, with the satisfaction that the few years he spent running around and the knowledge he has gained will prove invaluable to him. Contrast this side with the other, and I think the boy that gets around in his youth will stand at the head when a man.

I have often seen men, good workmen, that have worked in one shop for years—in fact, since they were boys—go to work in another shop. They would be all right until something new came along—then they were lost. Why? Because they were used to doing the same thing in the same way, in fact, had been doing it so long that they had begun to think that it was the only way to do it. They were past the age when their mind would grasp new things and ideas quickly, and all they could do was that which they had done before.

And this is the difference between the boy that stays and the boy that strikes out. He that stays gets so that he is afraid to get out, feels as though his was the only shop, and in case of a temporary shut down or lay off, comes wandering back again in a short time; while the other, secure in the thought that he knows how, and in his large experience and in the variety of his accomplishments—is never without pleasant and interesting work in a good shop, at first-class pay. The moral of this is: Strike out when you are young and see and learn something, so that when middle age has been reached there will be no sighing and regretting for what might have been.—Joseph Vincent, in Age of Steel.

Molding a Propeller Wheel in Green Sand.

The following sketches show one way of molding a propeller wheel with four blades from a pattern of one blade in green sand. The wheel is about 6 feet 9 inches in diameter.

The pit for the casting is dug, the spindle seat is sunk in the center of it, and the spindle is plumbed. The finger B, Fig. 1, is next fastened on the spindle, and to this finger is bolted strike a, which is leveled, and then bed c is struck up with it.

Four stakes B are then driven at four correctly spaced points. These stakes are just outside of the circle swept by the end of the propeller blade, so that the blade will pass between them and the spindle. You will see that they are set with the angle, and not the side, toward the blade. In setting these stakes I would have the carpenter take two strips of board and fasten them at right angles, the middle of one across that

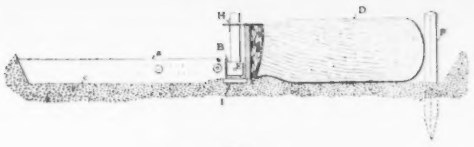


Fig. 1
SWEEPING THE BED

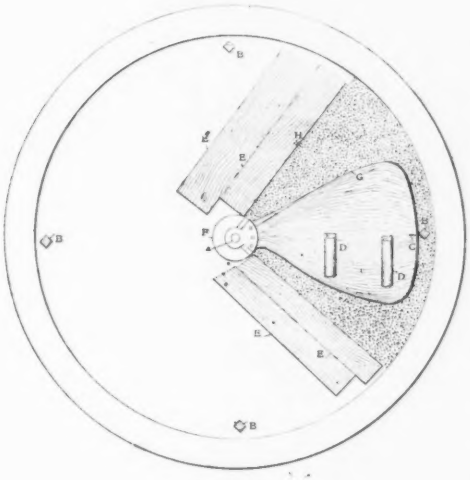


Fig. 2
FIRST BLADE BEDDED IN.

of the other, and have a hole the size of the spindle bored in the center. Cut the pieces then to a length equal to the diameter of the wheel, and mark the ends of the pieces, so as to form the corners of the square. Drop this cross over the spindle, and drive the stakes to match these marks. A mark c, Fig. 2, is now made on the pattern of the blade.

The propeller blade has on it a plate top and bottom, and a hole in each plate the size of the spindle, a loose fit, and in the top plate is squared out a place to drive a wedge, as at H, Fig. 1. The strike A being removed, the pattern of blade D is dropped on the spindle and rests on the core-print for the center core which is also dropped down the spindle and bedded in at I on the bed which has been swept, and the pattern is so placed that mark C, Fig. 2, meets the corner of the stake B. Weights D are placed on the pattern, also pieces of board are laid on the bed, as E. These boards serve to keep the bed in good condition while the first blade is being rammed up. The blade is now tucked under and rammed up, and we have Fig. 2 as a whole, and then the joint is made, which slants from the top of the blade G down to what is to be the bottom of the next blade, say at H, as near as we can guess.

The wedge at H, Fig. 1, is now loosened and the blade pattern is rapped and raised and swung around so that the mark C on the blade pattern will come to the corner of the next post, and this quarter is rammed up. This is continued until we have the four blades rammed up in the pit, which gives us Fig. 3, the parting being made as we go along, and the stakes drawn as each quarter is rammed up. The last time the blade is rammed up it is left in the sand.

The cope is next placed in position, and rapped down to a solid bearing, and the stakes at the four corners, as a, Fig. 5, are driven. The bars are fitted as near as can be got at, but it will be seen that there is a deep pocket of sand to carry to each blade. Bars are now pushed down between the bars that run across the cope, to as near the pattern as wished. These bars are known to the molders as chucks, and the operation would be termed "chucking the flask." These chucks are nailed in solid, and that quarter of the flask is rammed up. It is almost impossible to get all the chucks in it to fit all of the four blades, as there is but one blade pattern in the sand and the rest are the drag side impressions. It calls for a great deal of guesswork to bar those quar-

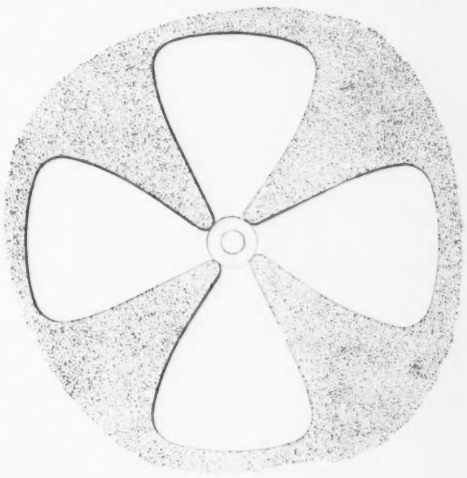


Fig. 3
THE FOUR BLADE IMPRESSION IN THE DRAG

Fig. 4
THE COPE

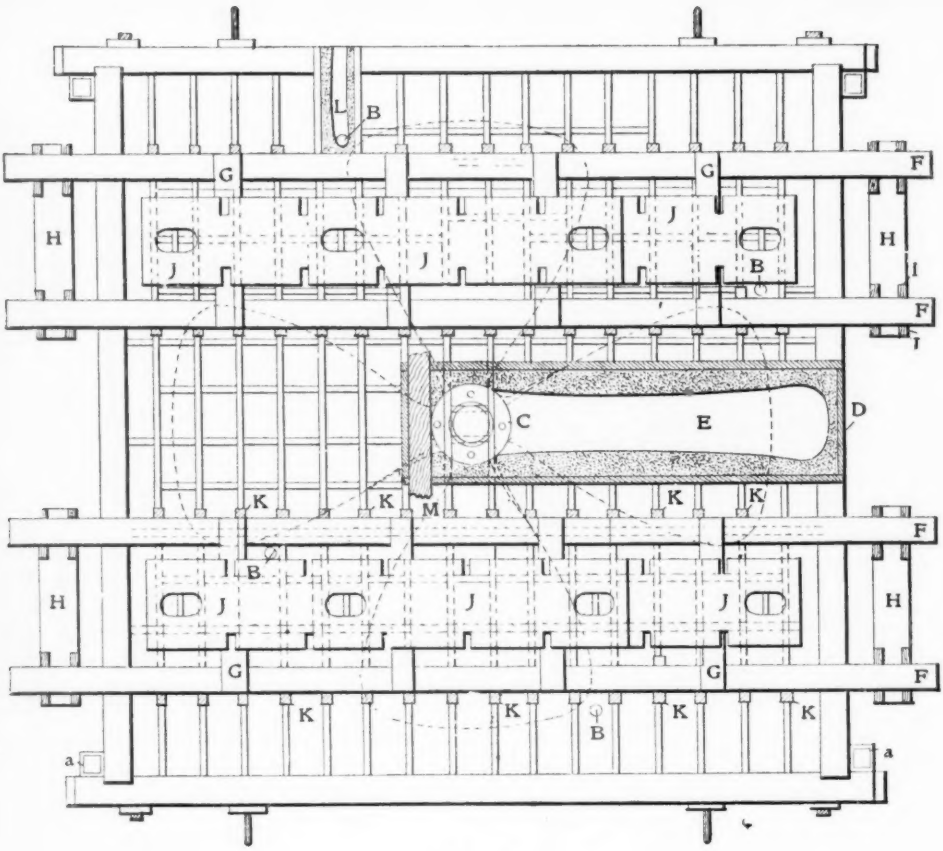


Fig. 5

TOP OF MOLD COMPLETE.

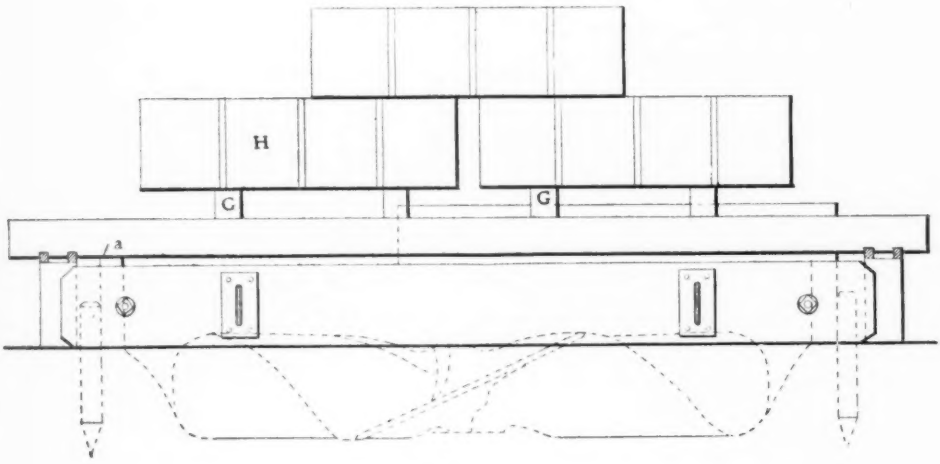


Fig. 6

SIDE VIEW OF MOLD.

ters and yet leave room for the thickness of the pattern; a part of it can be done, yet much cannot.

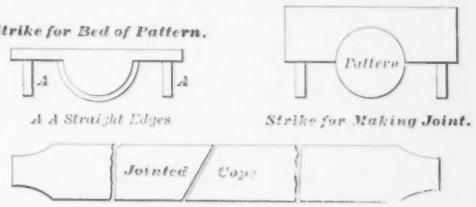
The quarter of the cope over the pattern is now rammed up, gate-sticks are set for riser B, Fig. 5, and also to carry off the vent, also the pouring gate for this quarter, as C, Fig. 5. Pig iron is placed on the opposite quarters of the cope to balance it, and the cope is hoisted off. Along near the upper side of the blade a channel-way is cut in the joint running to the gate-stick which was set to carry off the vent, and vents are run under the blade. The pattern is now drawn, and set back in the next drag impression. The cope is lowered on, any uncompleted chucking is done, the gate-sticks are set, and that quarter is rammed up; and so on for the remaining quarters. Care must be taken to ram solid and to secure well, as the chucking of quarters not rammed gives those that are quite a jar. Finally, the cope is lifted off after the last quarter is rammed, and it looks about like Fig. 4.

The mold is now finished and blacked, although on the extreme ends of the blades I would leave the blacking off, as that part is so thin that it might cause cold-shuts, and I would rather put in a little extra work in cleaning the casting. The core is now set. The cope is tried on after finishing. Ramming up the center bar is done by someone holding a piece of something underneath while someone else above rams in. The cope being tried on and found correct, is lowered on for good. Runner box D, Fig. 5, is placed in position, and runner E is built. Binders F are placed lengthways, resting on pieces of board laid on the edge of the cope, as a, Fig. 6, and cross pieces are laid from binder to binder, as G. Blocking also is placed under the ends of the binders, as H, Fig. 5, and wedged, as I. Weights are now placed on the cross-pieces, as H, Fig. 6, and J, Fig. 5; wedges, as K, are placed between the binders, and the bars, run-offs, as L, are built from the risers, and pieces of pig iron are laid across the runner-box over the center. Balls of clay are placed in the tops of the risers and lightly weighted, so that they will not blow out. Block well under the ends of the binders and weight well. In pouring, the iron must be in good shape, and sent in lively. Cut quick when you cut; but remember that there is more of a strain, or more lift, on a wheel cope of this kind than is usually thought.

In molding a four-bladed wheel, if the wings are narrow, a smaller cope may be used by bringing the blades in the corners. —R. H. Palmer, in American Machinist.

The New Hampshire Way.

In making long columns we first dig a hole in the floor a little larger than the required size of the pattern. After ramming this up to within 3 inches of bottom of pattern, straight edges are bedded in even with the floor level and everything rammed up to this height. Then take a strike for sweeping out a bed for the pattern as shown in sketch and after putting on about an inch of facing rap the pattern down and ram up, using a strike, as shown, to form the joint. The casting which we made in this way was 23 feet long, and as we did not have a cope long enough we used two, building on to each a slanting section to form a joint after the manner shown.



THOS. SHEEHY.

Newfields, N. H.

Greasing the Mold.

The patterns for castings used in foundries are made of wood, and frequently a number of articles are made from the same model. In such case if the same pattern is continuously employed its edges are apt to suffer, and it must either be repaired or renewed. It has been recently suggested that aluminium would be available for this purpose, and that from an original pattern in wood one of two copies could be cast. The aluminium patterns soon acquire a semi-greasy surface, and thus separates from the molding sand with peculiar ease. In case of injury, or when no longer needed, they can be melted down without loss of the material.—Cincinnati Enquirer.

Metallic Packing.

A subscriber desires the opinion of our readers as to the best mixture for metallic packing.

Melting Scrap Brass.

In melting scrap sheet brass a foundryman gives as his experience that the addition of half an ounce of aluminum to a No. 18 crucible of metal is the right proportion for a mixture that is high in spelter. Such a metal will run fluid in all the molds. To obtain a nice golden brass from scrap sheet, one pound of spelter and an ounce of aluminum is stated to be a good addition to bring about this desired golden color. Some brass founders add the aluminum to their mixture just before pouring, while others have a way of putting in the light metal while the pot is in the furnace and letting it boil. When the aluminum is added just before pouring it takes a smaller quantity than when it is put in and allowed to boil.—Aluminum World.

A Few Criticisms.

BY THOMAS D. WEST.

When any molder or founder who takes an interest in literature pertaining to the trade finds statements that do not agree with his knowledge or experience, they can advance the cause of progress by kindly criticism, to right what they think in error. In THE FOUNDRY there has been statements made which I cannot endorse, and a brief review of some of these might prove of value.

The first item I will discuss is one found in the January number, page 177, under the heading of "Uniform Metal," and which in the first paragraph says: "On breaking up some bad castings of say two inch thickness, one sees sometimes, as it were, two different kinds of iron in the piece, the lower half being dense, while the upper half will be more open and the iron looking as though it needed something." The balance of this article implies that the "something" needed was an additional brand of iron or a good stirring of the molten metal. I cannot say that I ever found occasion to attribute the difference of grain in the lower and upper half of castings to the need of using an additional brand or of stirring the metal in a ladle before pouring the mold. The difference in the density of the metal in the plate casting, referred to, is due to the rate of cooling. That part of a casting which cools or solidifies first will be the most dense. As molten metal flows over a flat surface the sand or bottom body of the mold cools the body of iron laying nearest it quicker than that which is nearer the cope. While in flat plates, etc., this causes the lower face side to be the most dense, we can make castings where this will be reversed. As an example, take the case of casting guns where the breech end, which is largest at the bottom, will show the iron to be of less density than the upper or muzzle end of the gun. This has been proven by specific gravity tests at the Builders' Iron Foundry, Providence, R. I., time and again. This is due to the breech end being larger than the muzzle end requiring a longer time to cool. Again, to show that the difference in the density is not due to the need of changes in mixtures, or the stirring of the metal, but lies wholly in the rate of cooling, can be proven by making an analysis of the top and lower side of the plate castings referred to. If this is done the only practical difference in analysis will be that the lower side will be found to contain higher combined carbon or less graphite than the upper side. It is well that this question has been raised as there are a great many who believe the difference in density in castings is due to head pressure of metal, ill-mixtures of iron or a lack of stirring. A study of these criticisms will, I believe, prove that their conclusions are in error.

In the April number, page 53, under the head of "Cast Iron Notes," the ninth paragraph says: "An increase of silicon would generally decrease shrinkage and chill, and never decrease chill and increase shrinkage." By this is meant as goes the contraction, so goes the chill. This is not always true. Anyone can take two flasks having one-half inch bars with plates at the ends to chill the ends of the bars and by pouring one at a lower temperature than the other, have very nearly the same contraction, but a great difference in the thickness of the chill. I have noticed as much as a one-quarter inch difference in the thickness of the chill, between two one-half inch square bars poured with the same ladle, but at different temperatures. The smaller the body of iron, the more subject it is to variations in the chill, by difference in the pouring temperature. This is one of the reasons why I discourage the system of using test bars as small as one-half inch square for making tests of cast iron.

On pages 54 and 55, April number, under the head of "Shot Iron and Hard Spots in Castings," the 11th and 12th paragraphs say:

"To prevent hardening this iron (shot iron) some foundries only permit a few buckets of water to be thrown on to deaden the surface." (Of the dump.) "Then again, to restore gang way shot, vents, etc., to their former condition, they are sometimes, after being cleaned, thrown on top of the cupola dump and permitted to anneal over night." This practice is in keeping with the old-time custom of picking out the chilled parts of plow points, car wheels, etc., from the gray parts of such scrap irons, on the belief that the chilled parts would cause hard spots in or harden the castings. At the meeting of the Western Foundrymen's Association in Cincinnati, October, 1897, I disclosed a discovery I had made, showed that chilled bodies gave a softer remelt than the gray bodies of chilled castings, thus demonstrating that the past practice of thinking chilled remelts would give chilled or hard iron or spots in castings was an erroneous one. This principle can also be applied to chilled shot, etc., and shows the ill conception of actual results that the founder has who would now place chilled iron or shot on a cupola dump to be annealed before he would remelt the material for fear it would harden his casting.

The closing paragraph of "Cast Iron Notes," on page 96 of the May Foundry, infers that anyone can determine the amount of silicon an iron contains by the contraction of a test bar. Such a doctrine is simply impractical. The combination of the metalloids to affect the carbon in being combined or graphitic in the iron and the rate of cooling (the latter of which is greatly affected by the dampness of the sand) is what controls the contraction. The only way to determine the amount of silicon in any iron is by a chemical analysis.

The next to the last paragraph in the article on page 102 of May Foundry says: "If we try to cure a shrink hole, we may form blow holes; if we try to cure blow holes, we may form shrink holes." Such is not practical of accomplishment. The factor that causes blow holes does not cause shrink holes, and vice versa. Neither are contingent on the other. A blow hole is caused by reason of damp sands, or poorly dried molds or cores, causing an excess of steam or gases, or ill-venting; not permitting steam or gases to pass off through proper channels, which, in an effort to escape through the molten metal, become imprisoned in the iron by reason of its solidfying before the steam or gases can escape. There are two factors which cause shrink holes, one is the expansion of metal at the moment of solidification enlarging the mold, if it is not too rigid, and thereby leaving a void space that, if not reached with additional metal, will leave a shrink hole in the part or parts last to solidify. The other factor is caused by the molecules, which were enlarged by heat returning to their normal size upon cooling. Hard grades of iron in solidifying partake a finer grain than those of soft iron, thereby assisting hard grades to possess the greater shrinkage. These two factors, expansion and variation in size of grain, effected by the state of the carbon, work in harmony to affect degrees in shrinkage. The fact of expansion affecting shrinkage I discovered about December, 1895. The details of the experiments leading up to this I gave in a paper to the American Institute of Mining Engineers at Pittsburg, February, 1896, which may be found in the proceedings of that society as well as in "Metallurgy of Cast Iron."

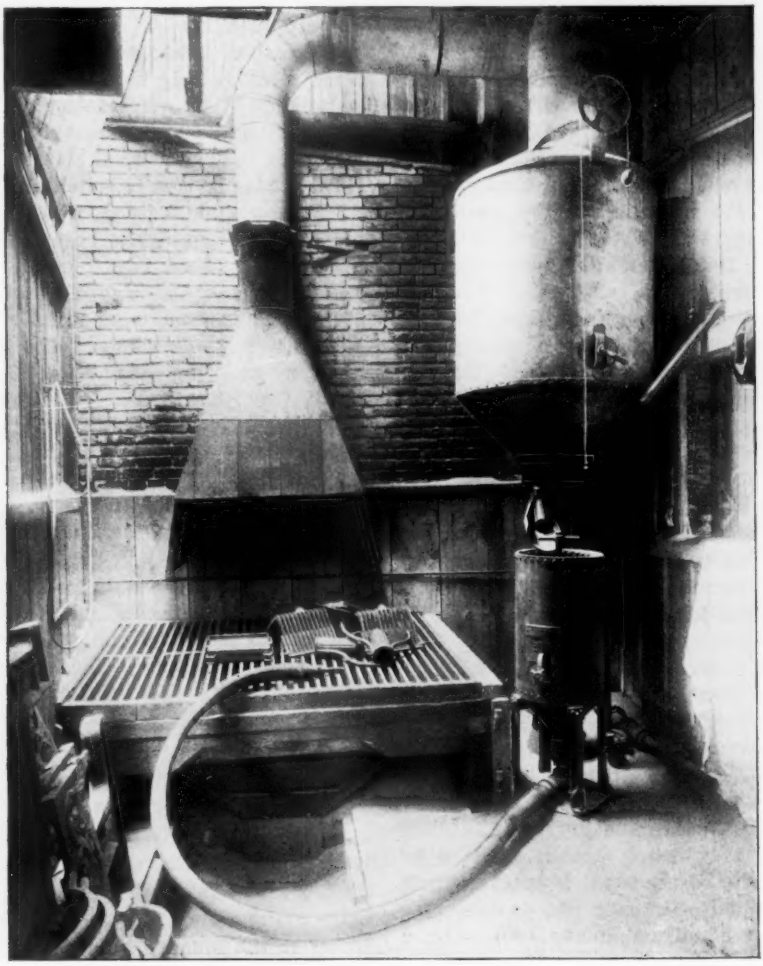
There are many unable to tell some blow holes from shrink holes, and for this reason are apt to confound the two. As a rule, blow holes are found in the lighter parts of castings, while shrink holes are found in the heavier parts or those last to solidify, and in no instance is one contingent upon the other.

New Essay on a Foundry.

In the foundry is the cupola where the iron is melted, the molds into which the molten metal is poured, and the paraphernalia appertaining thereto. The iron as it comes to the foundry is in pigs—that is, resembling in size and shape a month-old porker minus the legs and snout. Upon a fire of coal and coke the pigs are thrown and the air-blast turned on, by which a vastly higher temperature is attained than would be possible otherwise. The melted iron, flowing as freely as milk and about as easily handled, is drawn off in long handled ladles and poured into the molds which lie on the ground.

The making of molds, which is preliminary to each cast, is a trade by itself. Any piece of metal which is to be duplicated serves as a pattern. A rectangular frame, say three feet by one and a half and eight

inches deep is filled with molder's sand which resembles brown sugar. Upon this the pattern, say a pair of plow points, is laid and the sand smoothed off. Upon this is laid a duplicate frame and the molder duced to remain in the frame with nothing to support it, but the molder evinced no anxiety as to the outcome and the result warranted his confidence.—Plymouth (Wis.) Reporter.



THE PAXSON-WARREN SAND BLAST AND EXHAUST SYSTEM.

shovels into it more of the sand mixed with black loam and water, of such consistency as to cohere when squeezed in the hand. The damp sand is tamped down as the frame is being filled, and the latter when lifted off the first frame contains a perfect impression of the pattern. This is brushed over with plumbago and the pattern lifted out. The second frame is then replaced, funnel shaped openings are made in the top to admit the molten metal and the mold is ready for the cast. The wonder is to the uninitiated how the damp sand can be in-

The Paxson-Warren Sand Blast and Exhaust System.

A. G. Warren, who is in charge of the snad blast department of the J. W. Paxson Company, of Philadelphia, has designed the sand blast apparatus for cleaning castings shown in the accompanying engravings. That part to which the hose is attached is the sand blast proper, or, as it is more commonly known, "the mixer." Compressed air at suitable pressure, varying from 10 to 20 pounds, is piped to the mixer, and sand fed into the top through a valve, which is closed

when the machine is in operation. The operator directs the current of sand and air against the castings and the cleaning is done by the impact of the particles of sand. The other parts shown form a portion of the exhaust system which serves to clear the operating room from dust and to carry off the sand, which falls through the grate into a hopper, from the bottom of which it is piped up into the separator. The separator is practically an enlargement of the exhaust pipe and is located back and above the mixer. The draft through the separator is so weak that the sand falls to the bottom, where, by means of a pipe and valve, it is conveyed back into the mixer and used over again. The dust goes through the separator and is conveyed by a pipe to the washer, which also has a connection from the dust hood at the back of the grate. In the washer the dust enters a spray of water and falls to the bottom as mud, the washed air passing on to the exhauster and out of doors. The hopper located beneath the grate, as constructed here, obviates the necessity of digging and bricking up an extensive pit, which is a necessary requirement in some other systems. The grate is two feet above the floor and supports the medium sized castings while being cleaned. The larger castings are cleaned on a truck or car. The compressor, washer and exhauster are located in a room adjacent to the sand blast.

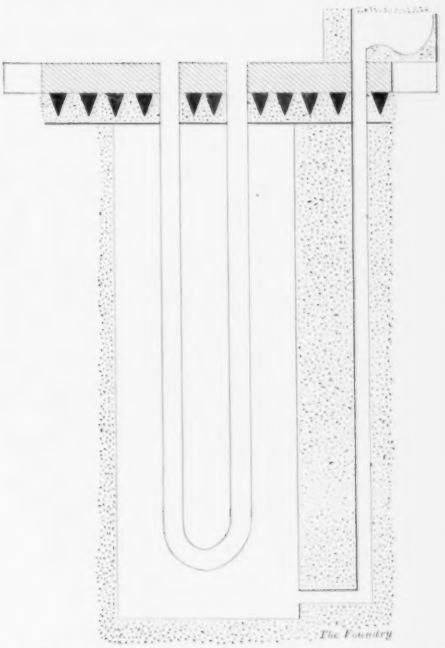
Co-Operation in an Iron Works.

The proprietors of the Hecla Iron Works, Brooklyn, N. Y., have adopted a limited system of co-operation in their business. Over 700 men are employed by the concern. The business was founded in 1876 by Niels Poulson as a small foundry, and has been growing steadily until to-day the works of the concern cover four city blocks in the Williamsburg district of Brooklyn. Structural iron work is their specialty. During the past year the concern have enjoyed a remarkable degree of prosperity, doing almost double the business done in any previous year.

President Poulson has announced that 33 heads of departments will henceforth enjoy the benefits of the new co-operative plan. It means that a foreman or head of a department who is at present receiving a salary of $2,000 will obtain interest on the amount of his salary in addition to the salary itself. The interest given will be measured by the dividends earned by the concern for the year. That is to say, if six per cent is earned on the money invested by the concern, a similar rate of interest will be paid to each of the 33 men on their salaries. The step, it is stated, is simply a preliminary one, and it is intended to extend the co-operative plan in the near future.

How I Would Do It.

Referring to the question of inserting a gas-pipe in a mold and casting it in that position without showing any blemishes, I would adopt the following plan, of which the attached illustration will convey an idea.



After ramming the pattern up in the floor and gating the mold as shown I would make a loam plate to cover the mold and fasten the gas-pipe thereto, filling the latter with fine dust or parting sand.

It is very difficult to cast anything of this kind in a horizontal position for as the iron rises in the mold it heats one side of the pipe first, causing unequal expansion and distortion no matter how many anchors are used to hold the pipe in place.

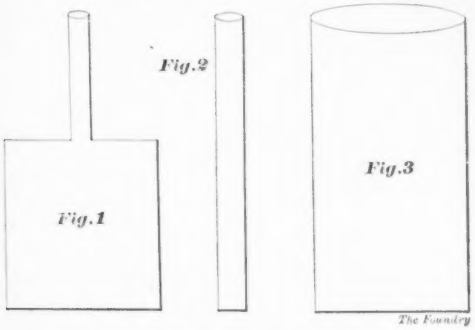
By following the method illustrated there is no need for the use of anchors or chaplets. As the iron surrounds the pipe completely as far as it advances there is nothing which can cause any bending or twisting of the pipe through unequal expansion.

If the pipe is clean it will be unnecessary to coat it with anything and the casting will be solid and clean too. W. H. KELL.

The Pressure of Liquid Iron.

In answer to the inquirer who asks the question, "In casting a wheel 48 inches in diameter and 12 inch face, one has a rim one inch thick, the second is six inches and the third 18 inches thick. Will there be a greater strain on the heavier ones, provided all other conditions are equal," I will say:

When the wheels are cast the strain upon each of the molds are equal as height in the only thing that changes pressure but the light one will become solidified sooner than the heavier ones consequently the strain will be relieved sooner. The difference is simply that the heavy ones have to hold the pressure longer and whenever the gates are set the pressure of the head is completely taken away from it. Allow me to quote Pascal's Law upon this matter: "Pressure



exerted anywhere upon a liquid inclosed in a vessel is transmitted undiminished in all directions, and acts with the same force upon all equal surfaces and in a direction at right angles to those surfaces." To illustrate this law take Fig. 1, which represents a vessel covered in with the exception of a ¼ inch tube inserted in the cover so as to bring the vessel up to the same height as the other vessels represented in Fig. 2 and Fig. 3, fill each of those vessels to the same height with any liquid and the pressure exerted on each will be the same per square inch of their surface. To prove this connect the three at any point below the liquid level and they will maintain the same height irrespective of volume.

EDWARD B. GILMOUR.

Manganese Mining.

Manganese occupies a prominent place today in the metallurgical world, owing to the valuable properties which it imparts to cast iron, steel and bronze. Although closely allied to iron and nickel chemically, unlike them it has no economic value as a metal until after it is alloyed with other metals, especially with steel and cast iron. In weight it is a little heavier than iron. In color it is light gray, with a yellowish red tinge. A comparison may be instituted between an iron-manganese alloy and an or-

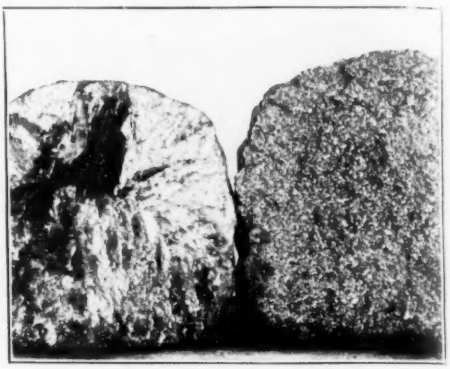


FIG. 1

SPIEGELEISEN. GRAY FOUNDRY IRON.

dinary gray foundry pig iron free from manganese, by referring to Fig. 1. This cut is a reproduction of a photograph of samples of each. That on the left is speigeleisen with 20 per cent. of manganese, while at the right is a piece of gray foundry iron without manganese. Manganese is neither malleable nor ductile and in this respect is unlike iron and nickel. Its melting point is higher than that of iron or nickel and it changes suddenly from the solid to the fluid state when it reaches the melting point.

Manganese does not exist in Nature as a metal, but is found as oxide or ore containing variable amounts up to 65 per cent. of manganese, and is often associated with earthy impurities, as well as with iron and zinc oxides. Some of these ores have a commercial value, as well for the oxygen obtained from them as for the manganese they carry.

Metallic manganese is obtained from the ore by the same process that is used to separate iron from its ores. This method is carried out in the blast furnace where the metal is reduced from the oxide by the use of coke, which also furnishes the necessary heat to melt the resulting metal. More or less iron is associated with the manganese obtained in this way. If the ores are richer in iron than in manganese we get an alloy

of iron and manganese called spiegeleisen. If the manganese predominates the resulting metal is called ferro manganese. To make the rich manganese alloys in the blast furnace requires not only rich manganese ores but also a high expenditure of fuel. It is seldom that ferro manganese contains over 80 per cent. of metallic manganese, the other elements being principally iron and carbon.

The carbon amounts to about five per cent. and is a very necessary ingredient where the ferro manganese is used as an addition to cast steel. Cast steel, especially Bessemer steel, on account of its method of manufacture, contains more or less oxygen, due to the action of the air blast passing through the fluid steel, and this oxygen must be removed before the steel is cast into ingots, as it would otherwise leave it rotten and worthless. Manganese in the form of spiegeleisen or ferro manganese is therefore added to the fluid metal just before pouring. It has two effects, namely, to take up the oxygen and to furnish the necessary carbon required to give the desired hardness in the steel. The amount of manganese required as ferro manganese or spiegel is determined by calculation.

Spiegeleisen is so called on account of the peculiar appearance which manganese gives to low silicon cast iron containing over four per cent. of manganese. Spiegel is the German word for mirror, and is applied to this iron on account of the mirror-like surface shown in the fracture. The effect of manganese on cast iron is complex. If used with understanding it is of great value, especially to the maker of chilled castings, and also in malleable cast iron mixtures.

Some years ago a great deal of interest was excited by the discoveries of Mr. R. A. Hadfield, of Sheffield, England, regarding the results to be obtained by alloying manganese with cast steel in various amounts up to 20 per cent. He found that by varying the per cent. of manganese a radical change occurred in the product; thus, from three per cent. to seven per cent. of manganese made a brittle steel, while over seven per cent. and up to 20 per cent. made it tough and hard and of considerable value for special purposes.

Mushet steel derives its self-hardening properties from manganese, carbon and tungsten which it contains. Manganese, if used in sufficient quantities, eliminates the greater part of the sulphur from melted cast iron and steel. The amount of manganese ordinarily found in steel and cast iron is not, however, sufficient to have effected an appreciable reduction in sulphur. Unfortunately high manganese in cast iron and steel affects these metals to their detriment in the qualities of strength and toughness, and for this reason manganese is not used to any extent to reduce sulphur.

Manganese bronze is an alloy of copper, tin and zinc with manganese added. It gives a strong dense metal much used by steamship builders for propellers. The propellers of the new White Star Line Company's steamship "Oceanic" are made of manganese bronze.

The most productive manganese deposit in this country is located in Augusta county,

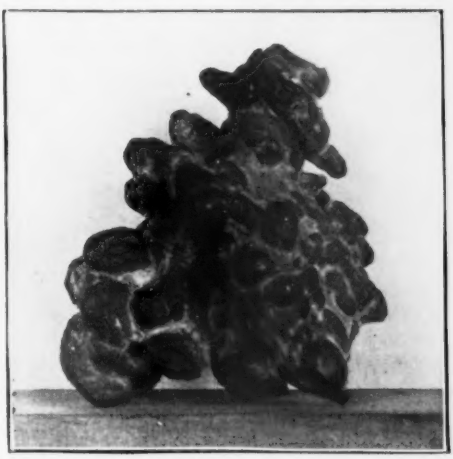


FIG. 2
SPECIMEN OF ORE WASHED DOWN INTO PIT.

Virginia, near Crimora, and 90 miles north of Roanoke. These mines, known as the Crimora manganese mines, have been worked at intervals since 1867, and have yielded from 150,000 to 200,000 tons of manganese ore, which is mostly found in the shape of kidney ore, embedded in soft, smooth, stratified clay. The ore does not occur in well defined beds or veins, but is scattered in irregular masses through a basin of clay. This clay basin covers an area of about 80 acres and varies from one to 160 feet in depth.

The ore was formerly mined by means of shafts and drifts, necessitating the use of much timbering to hold up the ground, and heavy pumping machinery to keep out the water. This expensive system has recently

been changed and since the property passed into new hands an entirely new method has been adopted. The ore is now being mined by the hydraulic method where streams of water under high pressure are directed by means of hose and nozzles against the clay which carries the ore, resulting in a complete separation, the ore remaining in the pit and the water and clay running off through a drainage channel, and by gravity finding their way into the Shenandoah river four miles away. A specimen of manganese ore washed down into the pit, showing its condition and appearance before treatment is represented in Fig. 2 which is reproduced from a photograph.

The ore is hoisted to a mill on the surface by means of belt conveyors, and after further washing and crushing and sizing, is loaded into cars ready for shipment. This way of mining manganese ore is unique and resembles the hydraulic method of mining gold from gravel banks, so common in certain California placer mining districts. At Crimora the water is brought from the adjacent mountains through sluice boxes several miles in length.

Other well known sources of supply of manganese ores in this country are the Franklinite mines in Sussex county, New Jersey, where manganese is associated with iron and zinc ores, forming the mineral franklinite, also Leadville, Colorado, where ores are found carrying manganese and iron, and a little silver. As the United States does not furnish sufficient manganese ore to supply the demand, considerable is imported from South America and Russia, where large deposits are found. Manganese ore in large quantities also exists in the eastern part of the Island of Cuba, not far from Santiago.

The market price of 80 per cent. ferro manganese is $100.00 per gross ton at Pittsburg. The production of ferro manganese and spiegeleisen in the United States in 1898 amounted to 213,000 tons and in 1899, 219,700 tons. Ferro manganese is made in this country by the Carnegie Steel Company, and spiegeleisen by the Colorado Fuel and Iron Company, of Pueblo, Colorado, and also by the Illinois Steel Company, at its works at Chicago, as well as by other eastern iron makers.—C. H. Vannier, in Modern Machinery.

Experience is what marks the practical man.

What to Do with Trade Papers.

One of the most common of sights in the office of a manufacturer, is a disorderly, dusty, crumpled pile of mechanical papers. They have the appearance, in most cases, of having been thrown together from across the office, and their handsomely printed pages and illuminated covers appeal mutely and helplessly against the base, neglectful position they are thus forced to occupy in the office of the very one to whose benefit and pleasure and edification they are devoted. "To what base uses have we fallen," seems their mute protest.

Occasionally, in the office of a thrifty, orderly manufacturer, they are piled, each paper by itself, in neat piles, sometimes behind glass doors, or curtains, and while this latter treatment is more in keeping with the high mission of these indefatigable and indispensable disseminators of mechanical knowledge and genius, yet even thus they are bearing the same relation to their real and possible mission in the mechanical world that a locomotive locked up in a roundhouse bears to its designed mission.

Mechanical papers are published to be read. Of what avail is their wealth of information, their helpful suggestions to artisans and workmen if they are, even carefully, piled away?

Every shop is filled with workmen, and the fact that they find employment in a machine shop is evidence to the fact that they occupy a position in the great thinking, ingenious world; one step at least, removed from the level of day labor. Every manufacturer knows the value of an ingenious, thougtful mechanic, one whose mind works in sympathy with his hands. And he knows also that nothing tends more surely to this end than that the workman be constantly informed of the developments and discussions in his own line of occupation, and he knows equally well that there is nothing to be compared, in value, with mechanical journals to this accomplishment, and that if his workmen should regularly read the mechanical papers, which lie in dirty confusion in his office, their value to him, as workmen, would be directly enhanced, that every evening hour spent in reading, means that many hours less in the corner saloon or in some equally useless or hurtful pastime. And yet, though pos-

sessed of this information, he rarely thinks of passing out these papers among his workmen. It would cost him but a trifle to provide a place where these papers would be gotten by the workmen and to pass around word to that effect.

A simple list of rules regulating the use of these papers by the workmen, rules as to the length of time that one was allowed to keep out a paper, and as to neatness in their use, etc., would not cost but a few cents and would cause respect, both for the journals and for their employer.

In a very few cases this practice has already been put into successful operation. In some cases an important step farther has been taken and a free reading room has been provided, lighted and heated and kept open of evenings for the free use of the workmen. In at least one case, a large circulating library has been provided for the free use of the men. It is needless to say that the workmen in this shop are of the higher order of skilled artisans; men who, by dint of study and intelligent application, have raised themselves to their present honorable position as skilled mechanics. Had their ambition and genius never been awakened to a vision of better things, they would not now occupy their present lucrative and honored position.

Very little would be gained along the line here advocated, if only a dirty shelf be provided and the disorderly, uninviting pile we have referred to be transferred to this shelf. Neither the employer nor the papers would gain much in the estimation of the workmen. anything that is worth doing is worth doing well. Far better to provide a neat, painted rack, or pigeon-hole case, with each apartment labeled with the name of the paper it contains, and with a tablet provided on which the man writes his name when he takes out a paper. He will be more likely to return it if his name, inscribed there, indicates that he has a paper out. His name inscribed there also serves as an incentive to others to take out papers, for the reason that the more intelligent and thoughtful ones will be the first to take out the papers, and such ones are the more influential among the force of workmen.

The mechanical papers of to-day are reflexes of the best thoughts and practices in applied mechanics, new kinks in shop practice are published and simple designs by the means of which a tool or a workman may do more or better work, all of which are of real value to the workman, and if so, then to the employer, and how is this desideratum to be accomplished if the workman be left in ignorance of them as they are published to the world.

Every year lifts the mechanical press up into a higher realm of practical usefulness. The mechanical papers of even ten years ago, were nothing like as complete and practical, either in point of reading matter or practical illustration, as they are to-day. They are weekly text-books of all that is most new, most helpful and most suggestive to a practical workman. Brought in studious contact with these practical ideas, the workman becomes involuntarily a better workman. And yet, in the case of nearly every manufacturer the country over, these valuable helps to efficiency on the part of his operatives, are left to cumber and disorder the office, when they should be a source of direct profit to both employer and employed.

Publishers also would be benefitted were the plan here suggested carried out, for once give a man a taste for reading and he will very likely become a subscriber. Advertisers would also be equally benefited, for, in not a small proportion of cases, the workman is the first to see the advantage this or that tool or appliance would be in the shop. And a wise employer will consult his best workmen as to the best and most serviceable tools to purchase.

From every point of view, this simple and inexpensive practice must appeal to a practical, progressive employer as sensible, practical and beneficial.

I have brought this matter to the attention of many manufacturers in the past few weeks, and in every case it has met with immediate and enthusiastic approval, coupled, in most cases, with the remark that they wondered they had not thought of it before. —Age of Steel.

The Successful Man Reads.

BY ELI H. PEARCE.

Some of the unread may think that after a man has gained an enviable prominence in his special line that he can cease to spend

hours in reading and studying up on his calling, but this is a great error, for knowledge is like money: the more we have the more we want, and it is a fact that our most learned and successful men are spending their spare time in study of their special calling in hopes of advancing a little further up the ladder of fame.

There is another class that may take a little advice, "the workman," and especially the young man. To these I will say, READ. That is the only way that you will succeed. Do not think that because you are a good workman that you know it all. Remember, there are others just as good, and a few that are better mechanics than you, and if they are reading they will certainly advance beyond your gait, for while you are depending on your own experience for your fund of knowledge they are also getting their share besides what they receive from reading the experiences of others, thereby holding their own and gaining from others, while you only receive what actual experience you obtain in your day's work.

There is, however, a different side to all questions, and so there is to this one. When a man that believes in reading tries to influence one that does not he is apt to receive for an excuse that a fellow cannot place any confidence in what is published in the trade papers, as they are run by a set of men that are merely out to make money, and that a great deal of the stuff published will not do when it comes to actual practice.

There is some logic in such a reply, as we have some papers that are mere money-making schemes without any foundation to base a set of claims as to being a channel from which to draw information.

But this is like the fellow who refused to go to church because one member was dishonest. We must not be like him. We must not put down all our papers as frauds simply because there are frauds in the business. But we must seek out the good, reliable paper, and then we can place our confidence in most that appears in it. But still, we must be on our guard, for it sometimes happens that even with the best of papers someone will occasionally slip in something that is merely based on what the writer thinks will happen if tried, and when you get down in the sand-heap to follow instructions you might be compelled to forget religion for the time.

Every experienced molder is a better workman when he adds to his personal experience that of others or book-learning. I notice that the best men that I come in contact with are readers, and I fully believe that half our troubles would vanish if we were only better read on general subjects, for while giving us practical pointers on our trade, reading has another noticeable effect, viz., it sharpens the wits, and a quick-witted man will get out of difficulties easier than a slow-witted one.

Was That So?

In accounting for the fact that scrap iron was selling recently at a price fully as high as the pig iron, which could be used as a substitute, a seller remarked that many of the smaller foundrymen preferred the scrap iron, because they were accustomed to it. This preference is sufficiently strong, in some instances, to induce the melters to pay even a higher price than for the new material. A very anomalous condition of the market would thus be created, were it not for another fact. The larger foundries, those that have expert chemists associated with the practical work of the foundry, are ready to drop old material and melt the pigs just as soon as the slightest economy points to the desirability of the change.—Iron and Steel.

Discovered in the Corn Belt.

The patterns for castings used in foundries are made of wood, and frequently a number of articles are made from the same model. In such case if the same pattern is continuously employed its edges are apt to suffer and it must either be repaired or renewed. It has been recently suggested that aluminum would be available for this purpose, and that from an original pattern in wood one or two copies could be cast.—Avon (Ill.) Review.

The majority of foundries make the mistake of installing a cupola too small for their needs. It is more economical to buy one a foot too large in diameter. An extra lining will bring it down to size, and the lining will last longer.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

WHITE IRON THE FIRST PART OF THE HEAT.

"I have charge of a shop here, just a new one. I have a new Colliau cupola; in fact, everything new. I am troubled with the first part of the heat coming hard. I use a mixture of 500 lbs. Scotch pig and 500 lbs. of No. 1 American iron, with 1,000 lbs. of good machinery scrap, using that mixture all through the heat and melting about 60 to 75 hundred per heat. Now the first 12 or 16 hundred that I draw from the cupola is so hard that we can do nothing with it. It is perfectly white. After about 12 or 16 hundred is run off the metal comes softer and the rest is as clean and as soft an iron as anyone would want.

"Now I claim that it is sulphur in the coke that causes the first iron to come hard, and that after it has been burning some time all the sulphur is in the iron or escaped from the stack, and the succeeding charges of coke are not heavy enough to affect the iron, or impregnate it with sulphur. The balance comes soft and good. There is sulphur in the coke I know, as we burn it in the core oven, and when we lift the door to go in you can hardly stand the gas, and you can see it by small yellow spots in the coke.

"I would like to know just what effect sulphur in coke has on iron, from someone who has had more experience than myself. I have never done any melting with coke myself before."

Answer.—The yellow spots that you think are sulphur are oxide of iron. It is possible that the coke that you use is high in sulphur, but it is probably good. Gray foundry iron will not often absorb from coke enough sulphur to harden it appreciably, because the pyrites that was in the coal has been decomposed by the coking process and the sulphur that remains is not apt to enter the iron. If your cupola was as hot at the beginning of your heat as afterwards, you would have no trouble. Add a little more coke to your bed and light the fire earlier. Try lighting the fire two hours before putting on the wind. It takes a great deal longer time to light coke than coal.

If this does not give you soft iron at first, use less scrap on the first charge.

You might purchase a little silicon pig of Drummond, McCall & Co., of Montreal, and add enough to make the first charge soft. You may be able to purchase silicon iron cheaper of the party in the United States from whom you purchase your American pig iron.

Your trouble is too cold a cupola, boiling of the first iron on the bottom of the cupola before it is dry, and boiling of the iron in freshly-lined ladles. Get everything hot and your trouble will cease, or you can increase silicon in the first two charges. You might try dividing your first charge into two charges and use half the coke for each.

FIRE CRACKING OF CASTINGS.

"The question is, with 130 shrinkage and strength 420 lbs., using a test bar ½ inch square by 12 inches long; with si. 3.15, phos. 1.12 per cent (a very moderate shop loss from breakage) what would be the probable cause of 'first fire' cracking of tops, oven tops or ashpits. Where the ashpit cracked there is no false bottom used. I claim that the trouble was not in the iron, but most probably that the stove was bolted too tight. I am quite sure the sulphur is low because we do not have to use much silicon to overcome it. The phosphorous is high, but it is a cold short and not a hot short agent."

Answer.—This is an ideal stove plate iron, and such a record shows the value of a foundry test. When you are sure that the iron is not in fault you will at once look in other directions for a cause. It is not excessive phosphorous because the general shop breakage is low and the test bar is very strong. Neither is the fault in bolting the stove too tight. All bolts must be so tight that the nuts will not loosen off in shipping. A great many years ago some manufacturers advised loosening bolts before the first fire was put in, but no one paid any attention to such instructions.

Such cracking can be stopped by thickening the parts that are heated too quickly. It is very difficult, if not impossible, to proportion new patterns to prevent "first fire" cracks. The best way is to do the best you know how, and then thicken up the places that crack when they are found. The joints of a stove shouldn't be fitted too close, and when a plate cracks look to see if any fins have been left on the casting, and if there is any bending of a casting when the stove is put together. If everything is free, then thicken the casting where it becomes hot first, which will make it heat slower at that point. Sometimes it is necessary to use a guard plate.

CHILLING IN FOUNDRY IRONS.

"We have sometimes noticed a chill at the end of test bars, the depth of which was very distinct, and again it is hard to determine where the chill leaves off. What is the cause of the different character of chills and what does it indicate as to the value of the two irons? We have had more trouble in the past 12 months in obtaining a satisfactory mixture than ever before. Have other founders had a similar experience?"

Answer.—The curious thing in the above questions "cracking" and "chill" is that both foundries are in the same city. Both are testing thin iron in the same way. Both make liberal use of chemical analysis. Both are in the same iron market, yet one has an ideal mixture and the other has the reverse.

Chill is a quality derived from peculiar nature of ores, or from fuel, or from conditions in the furnace. Chemical analysis will hardly ever show why one iron chills and why another will not. By splitting the end of a test bar which has run against a chill, the depth can be measured with an ordinary rule. Better use a steel scale divided to the 20th of an inch. Lay the scale along side the chill fracture, and estimate how many hundredths of an inch the chill extends. It is not difficult to determine. The less chill the better for light castings, but if all edges are soft, so as not to injure a file, the iron is right. The chill of some iron is harder than others.

St. Louis Items.

The old plant of the Todd Pulley & Shafting Works in East St. Louis, Ill., has been leased and started up by the Crescent Foundry Co. Mr. Thomas Harris, the young and energetic manager, is making a record for himself as a solicitor and hustler for work. Mr. Harris is a molder by occupation, and just stepped out of the sand heap into his present position and reports business good.

The Shickle, Harrison & Howard plant in St. Louis has closed down, and all patterns, flasks and other foundry tools have been sent over to the new plant in East St. Louis, Ill., but they still retain their foremen of the molding and coremaking departments, and rumor has it that they will start up again as soon as a switch is completed into the works, a much needed facility that the firm has often sought, but was never able to obtain until now.

The Scullin-Gallagher Steel Foundry, located in the suburbs of St. Louis, has started up, and is constantly increasing their force. Mr. Delehanty, formerly night foreman of the American Steel foundry at Granite City, Ill., is the general foreman.

Paddy Clifford, of the Shickel, Harrison & Howard Steel Works in East St. Louis, has resigned his position as foreman and gone to Milwaukee to accept a similar position there. Mr. Peter Ward, of St. Louis, succeeds him, the latter being one of the most popular foundry foremen in the west.

Pat Leonard, the best known molder this side of the Allegheny, is at his old home again in St. Louis, after an absence of two years in the east. He seems to increase in weight as he grows older, and works every day in one of the steel foundries on a job that he denominates, "A Stove Molders Cake Walk." He has taken to horseback exercise exclusively after working hours to reduce his weight.

"Dick" Powers, the "Old Reliable" of Timmermans Temple for so many years, has left there, and is now identified with the Magnetide Foundry Co.

C. RITIC.

Your Experience Please?

An important thing about the foundry is the removal of dust from the air in cleaning rooms. This may be done by ventilated barrels and an exhaust fan.

But the removal of sufficient air, from a warm room in cold weather, quickly reduces the temperature, unless the same warm air, freed from dust can be returned to the room.

Will some of your subscribers relate their experience in methods of separating the dust from the air and tell how to dispose of the dust without being offensive to one's self or adjoining neighbors, for the good of all?

EUREKA MFG CO.

Hot Iron.

Having occasion to move our foundry we took the opportunity of making a change in our cupola, and by so doing we gained a double purpose. We wished to melt a larger body of iron for heavy work and so raised the tuyeres two inches. This was a great

success, and to our great pleasure we are getting a very much hotter iron. There are so many reasons for cupolas not giving the desired results that a few of these reasons, simple as they be, are often overlooked by careless furnace men and "busy" foremen. Our cupola man could get no proper iron. On examining his fan several of the paddles were blown off.

Another melter was slow in producing his fluid and on looking into one of the tuyeres when the time was up the foreman saw a big piece of scrap weighing 250 pounds piled up against the tuyere. The melter had not put on the proper bed.

A Minneapolis foreman caught the proprietor on the scaffold throwing off coal. Another good reason for not getting hot iron. It goes without saying that this foreman quit.

The benefit to be derived from any course of education is dependent, largely, upon the attitude of the student. This is especially true of college education. It is well known that the student who secures his education under difficulties derives, generally, more benefit from the course than one who is furnished with unlimited means. The young man who is sent to college to graduate at the expense of his parents cannot appreciate his opportunity as well as he who pays his expenses from his own earnings. Students of correspondence schools are principally young men who are supporting themselves at day's work and studying in spare time. They pay for their own education and while the expense is small, they wish to make every dollar count. Consequently they pursue their studies earnestly and even make rapid progress in acquiring knowledge that will in due season, fit them for better positions.

Points on Fire Brick *

A 9-inch brick (straight) weighs 7 lbs. In ordering blast furnace linings, customers should send us a sketch showing outline of space to be occupied by brickwork.

Those ordering for cupolas and stacks should be careful to designate in order both inside and outside diameters, with height.

One cubic foot of wall requires 17 9-inch bricks, one cubic yard requires 460. Where keys, wedges and other "shapes" are used add 10 % in estimating the number required.

To secure the best results, fire bricks should be laid in the same clay from which they are manufactured. One ton of ground clay should be sufficient to lay 3,000 ordinary bricks.

Ground fire brick, or old cupola blocks mixed with fire clay, make the best cupola daub known.

Be careful of your furnace stays. Silica brick expand. Fire clay brick shrink.

Cool your furnaces slowly. Cold air after extreme heat is the hardest test on good fire brick.

Give us the diameter of your cupola shell and size you wish to line down to, and we will furnish you a block to fit.

A RULE TO FIND THE INSIDE DIAMETER OF ANY CIRCLE BY THE DIMENSIONS OF A BRICK.

Rule.—Double the length of the brick as representing the thickness of the wall, multiply that product by the size of the brick at the small end, substract from the size of the brick at the large end the size of the brick at the small end, divide the product by the difference, and the quotient will be the size of the circle in inches.

This rule can be relied on in calculating cupolas, arches, wedges and keys of any length or breadth.

Example.—What is the size circle that a key brick will turn, the sizes of which are 9 inches long, 4½ inches wide at large end and 4 inches wide at small end?

SOLUTION:

9 inches, length brick.
2

4½	18
4	4 inches, small end brick.
½ or .5	720
	144 inches or 12 feet, diameter.

Among the Foundries.

Geo. Greasby, Jr., is building a new foundry at Oskaloosa, Iowa.

Thomas Lawson, Ottawa, Ont., is building an addition to his foundry.

The Sherman (Texas) Iron Works is building a new foundry and machine shop.

The plant and equipment of the Fairhaven, Wash., Foundry & Machine Co. is for sale.

W. S. Wolff, of Philadelphia, has purchased the Lanning foundry at Bridgeton, N. J.

*From a catalogue issued by H. S. Vrooman, 220 West Twentieth street, Chicago.

Emil A. Weigel and Wm. Barnes will establish a brass foundry at Chattanooga, Tenn.

The Bundy Mfg. Co., of Binghamton, N. Y., are adding a brass foundry to their equipment.

The Ellis Keystone Agricultural Works will build a foundry 60x100 feet at Pottstown, Pa.

The Wheland Machine Works, Chattanooga, Tenn., are building a small addition to their foundry.

Partnership has been registered by The St. Maurice Foundry & Machine Co., Three Rivers, Que.

G. B. Rogers & Son, of Gainesville, Texas, will establish a branch plant at Chickasha, Indian Territory.

C. L. Darlington has leased the foundry at New Bloomfield, Pa., heretofore operated by W. M. Waggoner.

The Frick Mfg. Co., of Waynesboro, Pa., will erect a new fire-proof pattern storage house 110x40 feet.

The property of the Johnson Foundry & Machine Co., at Paducah, Ky., has been purchased by F. M. Fisher.

The Pennington Foundry & Heating Co. has been incorporated at Pennington, N. J., to manufacture radiators.

The Enterprise Foundry Co., of Knoxville, Tenn., will rebuild their plant, recently burned, upon a larger scale.

The Schwab Safe Mfg. Co., of Fostoria, Ohio, desire to lease their foundry department for a term of years.

The Dimmick Pipe Co., of Birmingham, Ala., which started less than a year ago, is preparing to enlarge its plant.

The Buda Foundry & Mfg. Company, Harvey, Ill., are building a brick addition to their works 100x200 feet, to cost $20,000.

A receiver has been appointed for the Eureka Foundry at Columbus, Ohio. Disagreement between partners is the cause.

The Washington Tool Co. has purchased the foundry and machine shop heretofore operated by G. J. Kaplan at Owatonna, Minn.

R. A. Wilson & Co., Shousetown, Pa., will operate a brass foundry in the vacant plant of the Sharon Boiler Company at Sharon, Pa.

The Kentucky Wagon Mfg. Co., of Louisville, Ky., will build a foundry and thereafter manufacture all of the castings it consumes.

The Mahoning Foundry & Machine Company, of Youngstown, Ohio, will build a large foundry and new machine shops at that place.

The Shaw Steel Casting Co., of Milwaukee, Wis., will build an addition to its foundry sufficiently large to increase its output fifty per cent.

The Chandler & Taylor Co. has broken ground for a new foundry, 120x250 feet, at Indianapolis, Ind. It will be of steel construction throughout.

The Neches Iron Works, Beaumont, Tex., are erecting three new buildings. They will be used for machine shop, forging department and foundry.

Cooper Bros. have purchased the plant of Valentine Blank, at Saltsburg, Pa., and will enlarge and equip the same for the manufacture of gas engines.

Osgood & Witherby, Charlestown, Mass., dealers in machinery, succeed Osgood & Hart. Mr. Witherby bought out the Hart interest in the old firm.

The Filer & Stowell Co., of Milwaukee, Wis., find the capacity of their foundry too small and will increase this as well as other departments of their works.

T. L. Jones and L. Garrison, formerly with the Enterprise Iron Works, of Albert Lea, Minn., contemplate starting a new foundry in that city the first of the year.

The Christopher & Simpson Architectural Iron & Foundry Company, St. Louis, Mo., have incorporated with a capital stock of $200,000; capital in Illinois, $10,000.

The Bessemer Gas Engine Company, at Grove City, Pa., have completed foundations for another building, 60x110 feet, and will also erect a small addition 60x32 feet.

The Pennsylvania Casting & Machine Company, of Allegheny, Pa., are building an addition to their works 60x150 feet. Some new machinery is to be installed and the force of employes increased.

W. H. Greer, Pine Bluff, Ark., has purchased an interest in the Pine Bluff Iron Works. The company are fitting up a new machine shop in connection with their foundry and expect to have it in operation by February 1.

The American Foundry Co. has been incorporated at Springfield, Ohio, by James F. Winchell, E. L. Dodson, George S. Dial, L. L. Winchell and H. Dodson. The new concern

will manufacture gas engines, an industry in which Springfield leads.

J. B. Smalley has purchased the interest of W. T. Smalley in Smalley Bros. & Co., Bay City, Mich., manufacturers of steam engines and saw mill machinery. The firm now consist of Wm. Smalley, the estate of D. C. Smalley and J. B. Smalley.

The North Pittsburg Foundry & Steel Company, of Pittsburg, with works in Allegheny, Pa., are large makers of cast iron soil pipe and fire hydrants. The concern also make castings of all kinds for water works and house and street drainage.

Enz & Orr, Denver, Col., iron founders, are adding a $2,500 foundry to their plant. The new building will be completed about January 1, and will be equipped with the most modern appliances for making both light and heavy gray iron castings.

The Susquehanna Casting Company, Wrightsville, Pa., manufacturers of builders' hardware and iron castings, have just completed a brick addition, 110x30 feet, to their works. Increased business has compelled them to double the capacity of their foundry.

John Haynes, of Cleveland, Saulpaw Bros. and Edwards Bros., of Calhoun, and S. F. Pierce and H. B. Henegar, of Charleston, have organized a stock company and will erect a stove foundry in Calhoun, Tenn. They expect to be ready to make stoves by January 1.

The Cheshire Brass Company, West Cheshire, Conn., whose brass casting shop, used in connection with their brass rolling mill, was entirely destroyed by fire last August, have replaced the same by a new building 40x90 feet, completely equipped and thoroughly up to date.

Architects J. H. Daverman & Son, of Grand Rapids, have prepared plans for a machine shop and foundry, 80x100 feet in size, to be constructed of stone and brick, with sheet iron roof, for the Western Machine & Tool Co., at Grand Haven, Mich. It will cost $9,000, and is to be completed by April 1, 1901.

The D. Clint Prescott Company, Menominee, Mich., have trebled the capacity of their plant since acquiring it from the old Menominee Iron Works Company, and still it proves inadequate to accommodate their business. Next spring they will enlarge their machine shop considerably and make other improvements.

The Broomell, Schmidt & Stacey Company, York, Pa., were incorporated recently with a capital of $150,000. The above company absorbed Broomell, Schmidt & Co., limited, and continue the manufacture of the American fuel economizer, steam heating apparatus, induced draft systems, etc., at the plant of the latter company.

The Mahoney Mfg. Company, Troy, N. Y., have been recently equipped with additional boilers, a new engine and an electric lighting plant. The placing of the electric plant involved extensive changes in the arrangement of machinery at the foundry. It is now one of the most modern and best equipped foundries in the state.

Hunt, Helm, Ferris & Co., Harvard, Ill., manufacturers of hardware specialties, are just completing a new foundry building, 50x100 feet, and also a commodious addition to their office. Their increasing business demands these improvements, and even more, which they are contemplating making in the early spring.

The Enterprise Foundry Company, Cincinnati, Ohio, are completing the erection of a new addition, 40x60 feet, to their present plant, which will give them a capacity of about 50 molders. In connection with the manufacture of sash weights of every description, the company are prepared to estimate on castings of any kind.

The Clark Bros. Company, Vicksburg, Mich., have incorporated, with a capital stock of $20,000. The new company succeed to the business of Clark Bros., manufacturers of steam specialties, and will add a brass and iron foundry to their plant in the spring. The officers are E. E. Clark, president; O. E. Clark, vice-president; W. A. Wood, secretary and treasurer.

Schwab & Sercomb, of Milwaukee, Wis., manufacturers of hot air furnaces and machine and general castings, have decided to build a large factory next year on a 50-acre tract of land which they own and which lies north of the city limits. Work will be commenced on the new plant early in the spring. Their present works are proving too small for their increasing business.

The Shetter Foundry & Machine Co., of New Cumberland, West Va., has been incorporated under the name of the Davis-Price

Foundry Co. The incorporators are C. J. Davis, Thomas M. Price, A. M. Shetter, George Wilson and Mrs. C. J. Davis. A new cupola has been ordered and the plant will be extensively repaired.

Phillip Walters, H. P. Walters and W. C. Hering, of Mansfield, have secured a lease on a portion of the plant formerly owned by the Fostoria (Ohio) Brass & Iron Works Company for the purpose of operating what will be known as the Fostoria Foundry & Machine Company. The property belongs to L. Schwab, of Lafayette, Ind., who is fitting up the remainder of the building as a safe and lock works.

The buildings and machinery of the Hillsdale Furnace and Foundry Company, at Hillsdale, Mich., have been leased by Horace Jerome and Judson Marsh and under the firm name of Jerome & Marsh they are now conducting a general foundry and machinist business. They will continue to make the Hillsdale furnaces under contract for the Hillsdale Furnace & Foundry Co., the latter company looking after the sales.

The Bakersfield (California), Iron Works, destroyed recently by fire, are being rebuilt on a larger scale and are designed to keep up with the increasing demand of the oil fields. The plans provide for a machine shop, blacksmith shop and foundry. It is expected that these shops will give work to nearly a hundred mechanics. G. W. Barnes, for some time superintendent of the Baker Iron Works in Los Angeles, California, is directing the affairs of the company.

The Akron Engineering Company, of Akron, Ohio, have been incorporated under the laws of West Virginia; capital stock, $100,000. Incorporators are C. A. Stowers, H. C. Spicer, R. E. Nevin, G. E. Kohler and Harvey Musser. Plans have been completed for two brick buildings, one 50x75 feet and the other 75x90 feet; the former will be used as a machine shop and the latter as a foundry. There will also be a separate office building.

The plant of the American Steel Casting Company, at Twenty-sixth street and Allegheny Valley Railroad, Pittsburg, has been closed. The ground upon which the plant is located is leased from the Schenley estate, and has been purchased by the Pennsylvania railroad for extensions to the yards of the Buffalo & Allegheny Valley division. The equipment in the plant will be removed to other plants of the American Steel Casting Company, at Sharon, Pa., and Alliance, Ohio.

Articles of association of the Hodge Iron Company, Houghton, Mich., who were organized in July under the laws of Illinois were filed in that city November 22. The articles show that the capital stock of the company is $100,000. The duration of the corporation is 50 years, and the stockholders and shares held by each are as follows: Charles J. Hodge, 998 shares; L. A. Hagle, 1 share; M. Wolfe, 1 share. Charles J. Hodge is president and manager.

The Louisville Foundry & Machine Company, Louisville, Ky., have incorporated to do a general foundry and machine business and construct electric elevators. The capital stock is $25,000, in shares of $100 each, distributed among the following incorporators: John Dolfinger, 40 shares; George Abell, 40 shares; Frank Dolfinger, 10 shares; E. A. Richter, 10 shares; John Prinz, 10 shares; Godfrey Lips, 10 shares; William Feltman, 10 shares.

The Interstate Foundry Company, of Cleveland, who were organized a few weeks ago with Martin Mullen president and B. H. Laven secretary and treasurer, have laid the foundations for their new foundry and are making every effort to have the buildings ready for occupancy shortly after the first of the year. They will have in the neighborhood of 100,000 square feet of floor space and will produce all kinds of light castings. Knox & Elliott, of Cleveland, are erecting the buildings. Contracts for the equipment are now being closed.

The Buckeye Engine Company, engine builders, Salem, Ohio, will extend their foundry something over 200 feet in length, which will more than double its present capacity. It will be equipped with two large traveling cranes of 15 and 25 tons capacity each. The Buckeye Engine Company have just finished a very considerable addition to their erecting room, so that in this and the foundry they hope to soon be in shape to take care of the increasing business that has come to them.

The William Bayley & Sons Company, Milwaukee, Wis., founders and machinists and manufacturers of the Bayley hot blast system for heating large buildings, are rapidly

recovering from their recent fire. They are building a new brick machine shop and blower department of heavy mill construction, to be three stories high. One building will have dimensions of 70x150 feet and one 50x200 feet. A blacksmith shop is also being added, 60x80 feet. These buildings are to be equipped with new machinery throughout and will cost about $35,000.

The Wrightsville Hardware Company, Wrightsville, Pa., have made several additions to their plant. A new foundry 180x50 feet has been built, and a new cupola, rattlers, overhead trolley system and hoisting apparatus have been installed, making it a most complete modern plant. This improvement enables the employment of 50 additional molders, making the number now employed over 100. A 65x40 feet addition has been made to the grinding and polishing department, and additional machinery installed.

At Hyde Park, Mass., there are being erected a factory and machine shop by the American Brass Foundry Company which is expected to be in operation by January 1, 1901. The officers of the company are experienced in this line of business. R. P. Moseley, secretary and treasurer, was for many years with the Brainard Milling Machine Company; W. S. Carpenter, superintendent, was with the Vulcan Foundry Company, Pawtucket, and J. W. Scully is general manager. The company expect to manufacture electric railway supplies and make Babbitt, brass and composition castings.

The Penn Steel Casting & Machine Company, Chester, Pa., is preparing to make extensive additions to its large plant. The foundry which is 400 feet long, will be enlarged to 600 feet. A smaller foundry will be added to accommodate two ten-ton furnaces. A new machine shop will be erected, doubling the capacity of the plant, and there will be four large ovens. The Penn will have the largest foundry in the United States for the manufacture of open hearth steel. Superintendent Baldt makes the statement that the improvements will be made "because we have confidence that there will be more business for us next year and the next few years to come than there has been in the past."

The Meadville Malleable Iron Company were incorporated on March 1, 1900, with a capital stock of $100,000. The company have erected and equipped at Meadville, Pa., a modern plant, which is said to be strictly up to date in every particular. The vice-president and general superintendent is H. F. Giele, for a number of years superintendent of the Malleable Department of the Gould Coupler Works at Depew, N. Y. The plant was started up on November 15 and the concern are about ready to begin operations and have a large number of orders on hand. They expect to do a general jobbing business. Samuel B. Dick is president and S. C. McDowell is secretary and treasurer.

The Vulcan Foundry & Machine Company, New Castle, Pa., since acquiring the plant of the old Vulcan Iron Company, limited, have made a number of very important improvements and additions, which have materially increased their capacity. At present the concern are running their large plant full time in every department, and have a good deal of work on hand. Some excellent records for foundry practice are being made by this concern, and on Monday, November 12, they melted 62 tons of iron in their cupola, which measures 44 inches inside diameter. They have an excellent arrangement for handling pig iron which saves considerable time and labor. The cars containing the metal are run in on their own switch, after which the pig iron is loaded onto a conveyor, is then picked up by a jib crane and deposited on a platform on a level with the cupola. This platform is of ample size, supported by heavy iron columns, and has contained at one time as high as 600 tons of metal. Other labor saving devices are used in the foundry with the view of securing as low a labor cost as possible. The foundry is commanded by two large cranes in which ropes are used instead of chain, and with very much more satisfactory results. The Vulcan Foundry & Machine Company are contemplating making further extensions and additions to their plant, which will give them much larger capacity. This concern are making a specialty of squaring, doubling and bar shears. Their other products consist of draw benches, mill castings and ingot molds. The officers of the concern are J. S. Kaufman, president; Nathan O. Strasberger, secretary and treasurer.

Build your shop so that it has plenty of natural light. It pays.

Deaths.

W. J. Hare, foundryman, Oshawa, Ont., is dead.

* * *

Henry L. Cummings, a member of the firm of the Castile (N. Y.) Chilled Plow Works, died in that city recently aged 62.

* * *

John Drew, for many years superintendent of the Rogers Locomotive Works, Paterson, N. J., died on December 5, at the Murray Hill Hotel, New York. Mr. Drew retired from business about ten years ago.

* * *

Otis A. Thayer, aged 65, the senior member of the Southside Foundry & Machine Company, of Charleston, W. Va., is dead from organic heart trouble. Deceased was one of the most prominent citizens of Charleston, and the Kanawha Valley.

* * *

David Mills, senior member of the firm of Mills & Ferguson, iron founders, died on December 3 at his home in Hoboken, N. J., from Bright's disease, aged 66 years. He was born in Scotland and came to this country when a boy.

* * *

Stephen Cox, aged 79, founder and active manager of the Cox & Sons Company, Bridgeton, N. J., died after a short illness. He was born in England, and came to the United States at the age of 30. In 1866 he founded the large machine and foundry plant which bears his name, his sons being admitted later into partnership.

* * *

Richard P. Jackman, who died recently in Denver, Colo., was born in Goffstown, Hillsborough county, N. H., December 16, 1834. When 17 years of age he was apprenticed to learn the trade of foundryman at Nashua, N. H. He worked at this trade until 1856, when he moved to Iowa. In 1860 he returned to his native state and resumed work at his trade, following the same until 1865, when he came west to Illinois, and located in Elgin. He here became a master workman, and was in the employ of different firms until June 1, 1877, when he engaged in business in his own behalf, and from that time prospered greatly. The firm was known as R. P. Jackman & Son, founders and machinists. Seven years ago the firm disposed of its interest to the Elgin Manufacturing Company.

Hugh M. Bole, a well-known resident of Bellevue, near Pittsburg, died December 8, at the age of 74 years. He was a native of County Down, Ireland. He came to Pittsburg in 1845 and served an apprenticeship in the machine business with Knapp, Totten & Co. In 1857 he entered a business partnership with Hugh M. Graham, under the firm name of Graham, Bole & Co. In 1860 he retired from the firm and engaged in the machine business for himself on Duquesne Way, Pittsburg. He remained in active business until a few years ago. During the Civil War he ran his works night and day for several years in the manufacture of guns for the federal government. Four sons survive Mr. Bole—John, an oil well tool supply manufacturer, of Pittsburg; Frank H., engaged in the same business in Butler; William A., of the Westinghouse Machine Company, and George M., of the Pittsburg Steel Construction Company.

Fires.

The large structural iron works of Geo. L. Mesker & Co., at Evansville, Ind., were destroyed by fire December 5. The fire is supposed to have originated in the foundry. The loss is estimated at $105,000, with insurance for $25,000. The buildings of several adjoining factories were also damaged to some extent, but not seriously.

A fire occurred on November 16 at the works of the Portland Company, Portland, Maine, manufacturers of engines, boilers and general machinery, which destroyed the wooden addition to their foundry. The building was completely consumed, with the flasks and patterns that were there at the time. The loss is under $4,000, which is fully covered by insurance.

The Appleton Mfg. Company, Batavia, Ill., manufacturers of wind mills and farm machinery, suffered the loss of their plant by fire. A considerable stock of finished machines was burned as well as much material in course of manufacture.

The plant of the Nelsonville (Ohio) Foundry & Machine Company caught fire in some mysterious manner December 2 and the foundry department was completely destroyed. The loss is between $4,000 and $5,000. It is supposed that the fire originated in some manner from natural gas but there are suspicions of incendiarism.

The Hackett foundry at Ogdensburg, N. Y., was damaged by fire November 27.

A portion of the foundry operated by Wm. Henderson at Watseka, Ill., was destroyed by fire December 12.

The building, foundry and machinery of the Lane & Bodley works at Cincinnati, Ohio, were burned December 13, the total loss being $200,000 to $250,000. About 200 men will be thrown out of work.

The City Foundry & Machine Works of Bristol, Tenn., were burned December 7. Loss estimated at $8,000, with no insurance.

Personal.

Henry B. Avery, mechanical and structural engineer for the Northwestern Foundry at Minneapolis, Minn., the past three years, has resigned his position.

J. W. Dopp, for some time foreman of the machine molding department of the Lowell (Mass.) Machine Shop Foundry, is now with the Geo. F. Blake Mfg. Co., at Cambridge, Mass.

C. W. Prosser, who was assistant general manager of the St. Charles Car Company for seven years, and after it was absorbed by the American Car & Foundry Company was general western sales agent of the latter company, has been tendered and accepted the position of general manager of the Southern Car & Foundry Company, with headquarters at Gadsden, Ala.

Then and Now.

In 1880 I was working in the old Vulcan in South St. Louis. The foundry was a department of the Vulcan Steel Works, steel rails being the exclusive specialty of the plant, the foundry department making nothing but repair work for the mills, including ingot molds. From twelve to eighteen molders were employed constantly, the foreman being a typical old Irishman familiarly known as "Jack Robinson," and a fair-minded man to work for. During the period from '80 to '84 business was nearly always good, and, although the Vulcan had the reputation of being the best place in St. Louis to work in, yet old Jack used to have an awful time to get molders to work there. The principal reasons for this were that the pay day came but once a month and that the Vulcan was located in the extreme southern limits of the city and away from real city life such as the average molder is used to.

The class of work was all that could be desired by any machinery molder, and he could suit himself about how much of it he did. There were plenty of helpers and foundry tools to work with, yet the shop was periodically short from two to six molders. The "Old Man" was often bewailing his lot because molders were not coming around looking for work, and complaining about the one who quit work yesterday to go up town to work, where, as the "Old Man" would say, "He will have no helper, work until 7 o'clock every night, and carry tons of iron!" He would generally wind up his complaint by saying: "If any of you boys get to the meeting to-night inquire if any floor molders are idle, and send them down. If you don't, I'll have to close the shop until I get enough men to take off a good heat."

Quite often he sent a boy up town to resorts frequented by molders to learn if any were idle, and if so to tell them to come down. He was humorous, too, for if a hobo darkened the door he would laugh and say: "I'll bet that fellow is a molder. I can tell by the good clothes he wears." Then he would saunter over near him and give an order of some kind, so that the "Bo" couldn't be mistaken as to who was "Boss." If the "Bo" got a job and was very ragged the "Old Man" generally went after him in this strain: "What hotel are you stopping at? Have you got your trunk moved up from the depot yet?" One day Jim Kirch jumped out of a box car as the train was passing the shop, came in and got a job and started to work right away, when the "Old Man" asked him if he had a hammer with him. When Kirch got his sand out he complained to one of the boys that he would have to have something to eat before he could work. He was supplied with the necessary money, and, after consulting the foreman, went out to satisfy his appetite. Kirch was a Southerner, and the next day at blast time he rolled a cigarette and began smoking. The "Old Man" saw him and laughed heartily, saying: "Yesterday that poor fellow came in here nearly starved, and to-day he is smoking 'cigaroots.'" To such a fellow the "Old Man" would generally say on the first day: "Don't over-exert yourself, now; you must be tired after riding in a Pullman car all night." Just recently in another shop a molder was off three or four days attending

to some business (a molder is always attending to some business when he is off on his own accord). He came in "unannounced" and started on his floor. The foreman spied him and said as he passed: "Watch me chase that fellow through the window." And he did, with the admonition to go and get good and drunk again for another week.

It used to be customary for a molder when looking for employment to be able to hire himself out by applying at any time of the day, but that seems to be all changed now. In the usual run of shops a molder must be on "the spot" at precisely starting time, with tools sticking out of his pockets and his lunch, done up in capsules, under his arm. Having applied for employment in a steel foundry a couple of months ago, I had an opportunity of seeing the foreman (?) start down the line as soon as the whistle blew, the bunch following him. He ascertains if any one is absent from his floor. If there is he turns to the "bunch," picks any old molder to fill the vacancy, and the man that comes late or lays off must take his place with the "bunch" when he shines in the morning, if he wishes to go to work. In this way some queer combinations are brought together, because, as a rule, they work in gangs, consisting of three molders and three helpers, consequently we sometimes see a bench molder, a stove molder and a loam molder or an ex-foreman, with a good floor molder who was fired only recently by the ex-foreman, and a helper that broke into the business through the assistance of the aforesaid ex-foreman, and is now competing with the "ex" with his brain and brawn!

C. RITIC.

Dr. Ludwig Mach has successfully alloyed aluminum with magnesium and thereby obtained a compound which can be worked like brass, and which is lighter still than aluminum. The densities of the two metals are: Magnesium, 1.75; aluminum, 2.75; they both melt at 800 degrees C., and their dilations amount to 0.023 and 0.027 mm. per meter and per degree Centigrade. The metallurgical properties depend upon the composition of the alloy. A 10 per cent. magnesium alloy resembles zinc, a 15 per cent. alloy is like brass, and a 25 per cent. like a compound bronze. The alloys can be soldered, it is stated, though that point does not appear to be fully settled, keep well in dry and damp air and give good castings. The alloy is almost as white as silver and so hard that it is possible to cut aluminum with a sharp-edged piece of magnalium. It can be turned, bored, etc., quite as well as brass, and clean and neat threads of ¼mm. pitch can be cut with ease. It does not file so readily as brass, but is superior in this respect to copper, zinc, and aluminum. Magnalium is suitable for lens mountings and would make good divided circles and arcs for instruments in which light weight is a consideration. If bought by volume it is a little less expensive than brass.

Notes from Various Sources.

We are informed by the Diamond Clamp & Flask Co., of Richmond, Ind., that they have just completed a new addition to their factory, making it now a 50x160-foot building, two story, devoted entirely to the manufacture of pattern shop and foundry supplies. And in addition to their snap flask and pattern shop trade, they have put in special machinery for the manufacture of floor flasks of all kinds, both wood and iron, as well as brass molders' flasks. Also special machinery whereby they are prepared to furnish foundries with straightened core wires, cut to order, core machines, for making straight cores, and all kinds of special machines for foundry use.

Owing to the increasing local fire brick trade and the facilities with which the wholesaling of fire brick can be handled from Chicago, the S. Obermayer Company are handling their fire brick business from that point. Mr. E. J. Woodison is manager of this department.

John A. Boughton, of Everett, Ohio, has secured a patent on machinery for treating molding sand. The product is known as the New Process Molding Sand and is said to be superior to this material in its natural state.

The American Bridge Company have just closed a contract with the North German Lloyd Steamship Company, calling for the erection of two steel buildings on the banks of the River Weser at Bremen, Germany. The machine shop building will be 100 feet in width and 300 feet in length, two stories in height. The foundry building is 75 feet in width and about 600 feet in length. Both buildings are designed after the best American practice.